Nevada Power℠

June 9, 2000

Mr. William Grimley
United States Environmental Protection Agency (USEPA)
Emission Measurement Center (MD-19)
Research Triangle Park (RTP)
North Carolina 27711

RE: Reid Gardner Unit-4 Final Test Report
EPA Mercury Information Request

You will find attached six bound copies and one un-bound copy of the Ontario Hydro Method (October 21, 1999) mercury testing conducted on Nevada Power Company's (NPC) Reid Gardner Station Unit # 4 (RG-4) coal fired generating unit.

The purpose of this submittal is to provide EPA with speciated mercury emissions data at the stack of RG-4. This data is intended to assist EPA in developing emission factors for boilers of this class.

NPC's Environmental staff conducted the "Standard Test Method for Elemental , Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fird Stationary Sources" (a.k.a. "Ontario Hydro Method") on April 19, 20 and 24, 2000.

Should you have any questions, comments or concerns on this matter please contact David Ewing at his office (702) 367-5657 or at his cellular (702) 277-4924.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name: Dennis J. Schwehr, Environmental Services
Designated Representative - Nevada Power Company

Signature: Dennis J Schwehr Date: 6-9-2000

cc: Mr. William Maxwell (USEPA)
Jeff Robb (MS/77)
file: DR file.

d:\ewing\intest\test2000\HgdrLtr2000.doc

SPECIATED MERCURY EMISSIONS TESTING
FOR NEVADA POWER COMPANY

FINAL TEST REPORT
REID GARDNER STATION
UNIT #4

Moapa, Nevada 89025

For:
United Station Environmental Protection Agency (USEPA)
Emission Measurement Center (MD-19)
Research Triangle Park
North Carolina 27711

Attention:
Mr. William Grimley / Mr. William Maxwell

JUNE, 2000

Performed by
Nevada Power Company
Environmental Services Staff
6226 West Sahara Avenue
Las Vegas, NV 89151

EHS 0002-00

Nevada Power

June 9, 2000

Mr. William Grimley
United States Environmental Protection Agency (USEPA)
Emission Measurement Center (MD-19)
Research Triangle Park (RTP)
North Carolina 27711

RE: Reid Gardner Unit-4 Final Test Report
EPA Mercury Information Request

You will find attached six bound copies and one un-bound copy of the Ontario Hydro Method (October 21, 1999) mercury testing conducted on Nevada Power Company's (NPC) Reid Gardner Station Unit # 4 (RG-4) coal fired generating unit.

The purpose of this submittal is to provide EPA with speciated mercury emissions data at the stack of RG-4. This data is intended to assist EPA in developing emission factors for boilers of this class.

NPC's Environmental staff conducted the "Standard Test Method for Elemental , Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fird Stationary Sources" (a.k.a. "Ontario Hydro Method") on April 19, 20 and 24, 2000.

Should you have any questions, comments or concerns on this matter please contact David Ewing at his office (702) 367-5657 or at his cellular (702) 277-4924.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name: Dennis J. Schwehr, Environmental Services
Designated Representative - Nevada Power Company

Signature: Dennis J Schwehr Date: 6-9-2000

cc: Mr. William Maxwell (USEPA)
Jeff Robb (MS/77)
file: DR file.

d:\ewing\intest\test2000\HgdrLtr2000.doc

6226 West Sahara Avenue, Las Vegas, NV 89146 • P.O. Box 230, Las Vegas, NV 89151-0001
702.367.5555 • 702.367.5554 fax • www.nevadapower.com

TABLE OF CONTENTS

APPENDICIES:

LIST OF FIGURES

LIST OF TABLES

1

INTRODUCTION

1-1 Summary of Test Program

1-1-1 Purpose of Test

Nevada Power Company (NPC) is pleased to submit this Final Test Report for our Reid Gardner Unit # 4 (RG-4) coal fired generating source at Reid Gardner Station.

This test program was performed to meet the requirements of the EPA Mercury Information Request. The test unit was selected at random by the EPA to provide speciated mercury emissions data, which will then be used to develop emission factors for boilers in its class.

Measurements collected were speciated mercury emissions at the stack, speciated mercury concentrations at the inlet of the boiler's last air pollution control device, and fuel mercury and chlorine content. Fuel mercury and chlorine content are listed within Appendix D of this report.

NPC's Environmental Services staff conducted the "Standard Test Method for Elemental, Oxidized, Particle-Bound, and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources. This test is also known as the "Ontario Hydro Method (October 21, 1999)". A copy of the Ontario Method is within Appendix G of this report. All testing was performed concurrently at the inlet and outlet of the last emission control device to determine mercury emissions present at the inlet (outlet of the baghouse) and outlet (Stack test platform). The unit was fired on coal at 100% load during these tests.

These tests were conducted on April 19th, 20th and 24th, 2000.

Table 1-1 presents a summation of the test data observed during testing activities.

Table 1-1 Summary of Test Results

	RUN-1	RUN-2	RUN-3	AVERAGE
Test Date	4/19/2000	4/20/2000	4/24/2000	
Test Time	11:52 to 14:01	10:41 to 12:35	10:26 to 12:50	2+hours
Unit Operation				
Unit Load, MW net	266	267	266	266.33
Steam Flow, klb/hr	2325	2320	2325	2323.33
Coal Mills in Service	3	3	3	3
Coal Flow, tons/hr	120	120	120	120
SO2, lb/MMBtu	0.0879	0.0853	0.0785	0.0839
NOx, Lb/MMBtu	0.3288	0.3136	0.3648	0.3357
Opacity, %	<1	<1	<1	<1
Inlet Gas Properties				
Temperature, F	339.27	316.42	321.23	325.64
Gas Flow, dscfm	253,110.58	282,761.39	285,867.05	273,913.01
O_2, %	3.5	3.8	4.5	3.9
CO_2, %	15.30	15.23	14.70	15.08
Stack Gas Properties				
Temperature, F	146.02	141.89	145.44	144.45
Gas Flow, dscfm	740,314.8	711,367.1	755,830.7	735,837.5
O_2, %	7.90	7.66	7.90	7.82
CO_2, %	11.60	11.92	11.70	11.74
Inlet Mercury Speciation				
Particulate Mercury				
Ug/10^{12} Btu	6.039	12.54	0.075	6.218
Lb/10^{12} Btu	$1.329x10^{-8}$	$2.759x10^{-8}$	$1.651x10^{-10}$	$1.913x10^{-8}$
% of Total Hg	95.8	97.3	28.1	73.7
Oxidized Mercury				
Ug/10^{12} Btu	0.060	0.067	0.064	0.064
Lb/10^{12} Btu	$1.326x10^{-10}$	$1.479x10^{-10}$	$1.405x10^{-10}$	$5.640x10^{-10}$
% of Total Hg	0.96	0.52	23.95	8.48
Elemental Mercury				
Ug/10^{12} Btu	0.205	0.284	0.128	0.206
Lb/10^{12} Btu	$4.509x10^{-10}$	$6.254x10^{-10}$	$2.809x10^{-10}$	$4.524x10^{-10}$
% of Total Hg	3.25	2.20	47.90	17.78
Total Mercury				
Ug/10^{12} Btu	6.305	12.890	0.267	6.487
Lb/10^{12} Btu	$1.387x10^{-8}$	$2.837x10^{-8}$	$5.865x10^{-10}$	$1.97x10^{-10}$

Stack Mercury Speciation	RUN-1	RUN-2	RUN-3	AVERAGE
Particulate Mercury				
$Ug/10^{12}$ Btu	0.094	0.094	0.095	0.043
$Lb/10^{12}$ Btu	$2.076x10^{-10}$	$2.062x10^{-10}$	$2.089x10^{-10}$	$2.076x10^{-10}$
% of Total Hg	23.9	20.0	22.7	22.2
Oxidized Mercury				
$Ug/10^{12}$ Btu	0.080	0.079	0.011	0.057
$Lb/10^{12}$ Btu	$1.767x10^{-10}$	$1.740x10^{-10}$	$2.311x10^{-10}$	$1.939x10^{-10}$
% of Total Hg	20.30	16.85	25.12	20.76
Elemental Mercury				
$Ug/10^{12}$ Btu	0.221	0.297	0.218	0.245
$Lb/10^{12}$ Btu	$4.858x10^{-12}$	$6.525x10^{-12}$	$4.799x10^{-12}$	$5.394x10^{-12}$
% of Total Hg	55.84	63.18	52.17	57.06
$Ug/10^{12}$ Btu	0.396	0.469	0.418	0.428
$Lb/10^{12}$ Btu	$8.701x10^{-10}$	$1.033x10^{-9}$	$9.199x10^{-10}$	$6.001x10^{-10}$
Boiler Board Data				
Unit Load MW, net	266	267	266	266.33
Steam Flow, klb/hr	2325	2320	2325	2323.33
Coal Mills in Service	3	3	3	3
Coal Flow, tons/hr.	120	120	120	120
Exit gas temperature, F	146.02	141.89	145.44	144.45
CEMS DATA				
CO2 %, wet or dry	11.60	11.92	11.70	11.74
SO2, lb/MMBtu	0.0879	0.0853	0.0785	0.0839
NOx, lb/MMBtu	0.3288	0.3136	0.3648	0.3357
NO2, (if available)	N/A	N/A	N/A	N/A
Opacity, %	<1	<1	<1	<1
Stack Flow, klb/hr	253,110.58	282,761.39	285,867.05	273,913.01
FGD DATA				
SO2 at inlet, lb/MMBtu	0.7008	0.6286	0.7024	0.6773
SO2 at outlet, lb/MMBtu	0.0879	0.0785	0.0853	0.0839
Gas inlet temperature, F	339.3	316.4	321.2	325.6
Gas outlet temperature, F	146.0	141.9	145.4	144.4
FABRIC FILTER DATA				
Pressure drop, iwg	7.85	7.50	8.10	7.82
Outlet duct opacity, (if available)	2.35	2.20	2.30	2.28
B.H. Gas inlet temperature, F	N/A	N/A	N/A	N/A
B.H. Gas outlet temperature, F	339.3	316.4	321.2	325.6

1-1-2 Test Unit

The test unit (RG-4) is operated by NPC, and is located At NPC's Reid Gardner Station in Moapa, Nevada (approximately 50 miles) northeast of Las Vegas, Nevada. RG-4 is within the jurisdiction of EPA Region IX, and is permitted, and monitored by the Nevada Department of Environmental Protection (NDEP) via Operating Permit # 1930. A copy of the RG-4 Operating permit is included in Appendix G. The EPA as part of the following category selected the unit:

- Fuel type: Coal
- SO_2 control type: Wet (sodium carbonate) absorbers (scrubbers)
- Particulate control type: Bag house

RG-4 is a coal-fuel-fired electric utility generating facility classified as a major source under the unitary permitting regulations of 40 CFR 70 §70.2. The Foster Wheeler Company made the RG-4 boiler. It is wall fired and has low NOx burners and over fire air for NOx control. It has a baghouse for particulate control and it has three wet scrubbers (sodium carbonate) for SO2 control. All generating and support processes at the site are grouped under the Standard Industrial Classification Code (SIC) 4911.

RG-4 employs a Continuous Emission Monitoring System (CEMS) consisting of a three point, extractive, system to measure NO_x, SO_2, CO, CO_2 and O_2 on dry basis at the stack (outlet) and both absorber (scrubber) inlets. The CEMS system includes a Rosemount Model 951C NO_x analyzer (0-1,000 ppm), a Siemens Ultramat Model 5E SO_2 analyzer (0-50 and 0-750 ppm range); a Siemens Ultramat Model 5 CO analyzer (0-50 and 0-500 ppm range); a Siemens Ultramat Model 21 CO_2 analyzer (0-20% range) and Siemens Oxymat Models 5E and 5F (dry and wet) O_2 analyzers (0-20%). Flowrate (stack) and temperature is be recorded by a United Sciences Model 100 ultrasonic flowmeter (0-5700 fpm). Moisture is measured indirectly by measuring the difference between the dry O_2 reading and the wet O_2 reading.

The electrical generation process is supported by the operation of several interactive on-site components comprised of fuel (coal and distillate oil) storage and transfer systems, water treatment & processing systems (ponds, purification equipment, cooling towers, etc.) and administrative/support facilities.

1-1-3 Test Measurements

The mercury test program consisted of the following tests, with triplicate sets of measurements performed simultaneously at each test location.

- Particulate, oxidized, and elemental mercury emissions at the outlet (stack) exhaust per the Ontario Hydro mercury speciation method. See Appendix A, B, and D
- Particulate, oxidized, and elemental mercury concentrations at the last air pollution control device inlet. See Appendix A, B, and D.
- Mercury and chlorine content of representative coal samples collected from the coal feeders. See Appendix D

All changes to the test schedule were coordinated between the Test Director (Dave Ewing) and the plant operations contact (Jeff Robb). Jeff Robb communicated scheduling changes to the appropriate plant management and operations people.

Prior to sampling, a full day was scheduled for equipment set up. Set up activities included setting up the equipment at the test locations, verification of power at the test locations, and conducting a preliminary velocity traverse with the boiler operating at or near the target test load).

Test team personnel arrived at the plant four (4) hours before the target start time of the first test run on each of the days for sampling days. Pre-test activities included final equipment set up and leak checks, verification of target unit operation, and verification of communication links between team members, team leaders, and plant personnel.

1-1-4 Notes on Nomenclature

Inlet

The EPA has indicated that "inlet" sample location is the inlet to a boiler's last air pollution control device. At RG-4, the inlet location is a single port downstream from the bag house and upstream from the wet scrubber. For simplification, the term "inlet" is used throughout this report.

Stack

The term "stack" (or "outlet") is used to represent exhaust gases downstream of the last air pollution control device for RG-4. This location is 250 feet up the stack. For simplification, the term "stack" is used to identify the outlet throughout this report.

1-1-5 Key Personnel

Responsible people and organizations for this project were:

Test site operator: Nevada Power Company,
Reid Gardner Station.
P.O. Box 77, Moapa, NV 89105
Telephone: (702) 367-5900

Test site Responsible Official:
Mark J. Sandoval
Director, Reid Gardner Station
P.O. Box #230 M/S 77
Las Vegas NV 89151
Telephone: (702) 367-5900, Ext.201
Fax: (702) 367-5885

Test program manager:
Dave Ewing
Test Director
NPC Environmental Services Department
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5657
Cellular: (702) 277-4924
Fax: (702) 227-2051

Plant Operations Officer:

Jeff Robb
Plant Environmental Scientist (Reid Gardner)
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5900, Ext. 305
Fax: (702) 367-5885

Methods Auditor:

Chris Heintz
Plant Environmental Scientist (Clark, Sunrise, Harry Allen)
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 434-7111
Fax: (702) 434-7730

Site Chemist:

On duty Sample Lab people
NPC Reid Gardner Station.
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5900, Ext. 406
Fax: (702) 367-5885

Safety Officer:

Carol Madril
Plant Safety Consultant (All Generation Plants)
P.O. Box #230 M/S 77
Las Vegas, NV 89151
Telephone: (702) 434-7111
Fax: (702) 434-7730

Sample analysis: (Contractor Laboratory Team:)
Nevada Environmental Laboratory (NEL):

Stanley VanWagenen (and staff)
NEL Division Manager
4208 Arcadia Way, Las Vegas NV 89030
(702) 657-1010

A more detailed account of the testing participants and their duties is included in Appendix F

Table 1-2 lists the test program organization and key individuals with responsibilities, phone numbers, and e-mail addresses.

Table 1-2
Test Program Organization and Responsibilities

Organization	Individual	Responsibility	Reports To	Phone Number	Fax Number	E-mail Address
Responsible Official	M.J. Sandoval	Plant Manager	Vice President	(702) 367-5900 Ext.: 201	(702) 367-5885	SondovM@nevp.com
Project Management						
NPC's EHS	Dave Ewing	Test Director	EHS Director	(702) 367-5657	(702) 227-2051	Ewingd@nevp.com
EHS Sampling Team						
Director	Dave Ewing	Test Director	Dennis Schwehr	Cellular: (702) 277-4924	(702) 227-2051	Ewingd@nevp.com
Plant Operations	Jeff Robb	Unit operations	Dave Ewing	(702) 367-5900 Ext. 305	(702) 367-5885	Robb@nevp.com
Methods Auditor	Chris Heintz	Operating Compliance	Dave Ewing	(702) 434-7711	(702) 434-7730	Heintz@nevp.com
NPC Chemist	Plant Water Lab	Chemical makeup's	Dave Ewing	(702) 367-5900 Ext. 406	(702) 367-5885	
NPC Safety Officer:	Carol Madril	Safety Consultant	Safety Manager	(702) 367-5900 Ext. 425	(702) 367-5885	MadrilC@nevp.com
NEL (Laboratory) Team						
NEL Labs	Stan. VanWagenen	Chemist	NEL President	(702) 657-1010	(702) 657-1010	Vanwegenen@nelabs.com

2.

PLANT AND SAMPLING LOCATION DESCRIPTION

2-1 Process Description

2-1-1 Reid Gardner Station

Reid Gardner Station is a fossil-fuel-fired electric utility generating facility classified as a major source under the unitary permitting regulations of 40 CFR 70.2.

The site consists of four external combustion boilers that serve to produce electricity for sale as the sole function of the installation. As such, all generating and support processes at the site are grouped under SIC Code 4911. The electrical generation process is supported by the operation of several interactive on-site components comprised of fuel storage and transfer systems, water treatment and processing systems (ponds, purification equipment, cooling towers, etc.), and administrative/support facilities that are described further in this section.

2-1-2 RG-4 General Specifications

RG-4 is a wall-fired boiler that can operate at varying load from 130 (minimum stable load) to 295 MW (net) throughout the year, excepting outages. This unit typically runs full load, however, circumstances such as mechanical failure, malfunction of pollution control equipment, or economics of fuel pricing can occur which determine operation of the unit at some alternate level below full load, but above stable load. The primary operating scenario for this unit is also generally defined to include startup and shut down operations, with combustion of #2 distillate oil as the secondary fuel required to facilitate unit heat-up and flame stabilization as necessary). The unit operates without restrictions related to hours of operation, provided it remains in compliance with applicable permit (#1930) requirements (see Appendix-G). The description of processes provided for this unit is applicable to the primary operating scenario.

2-1-3 Key Parameters

Key unit parameters include:

- Unit capacity: 305MW gross, 295 MW net
- Boiler type: Foster Wheeler, low NOx burners, negative draft
- Fuel type: bituminous/subbituminous, low sulfur level, from Utah
- SO_2 control: Three wet (sodium carbonate) absorbers (scrubbers) with an 85% removal rate.
- Particulate control: Baghouse at 99%
- NO_x control: Over fire air, & low NOx burners

2-2 Other RG-4 Processes

It is expected that RG-4 support processes such a coal handling, cooling needs, water treatment and pollution control operations would vary in a general relationship with the load of each generating unit at the site. Therefore, it is logical that the emissions potentials could only be reduced should these processes require adjustment to match unit requirements related to the primary or alternate operating scenarios. With the possible exception of cooling tower particulate emissions, which are a function of total dissolved solids, meteorology, and the number of fans in service, fugitive emissions would not be expected to be significantly adversely impacted by primary or alternate operating scenario changes as described.

Figure 2-1
Example Boiler Schematic
60

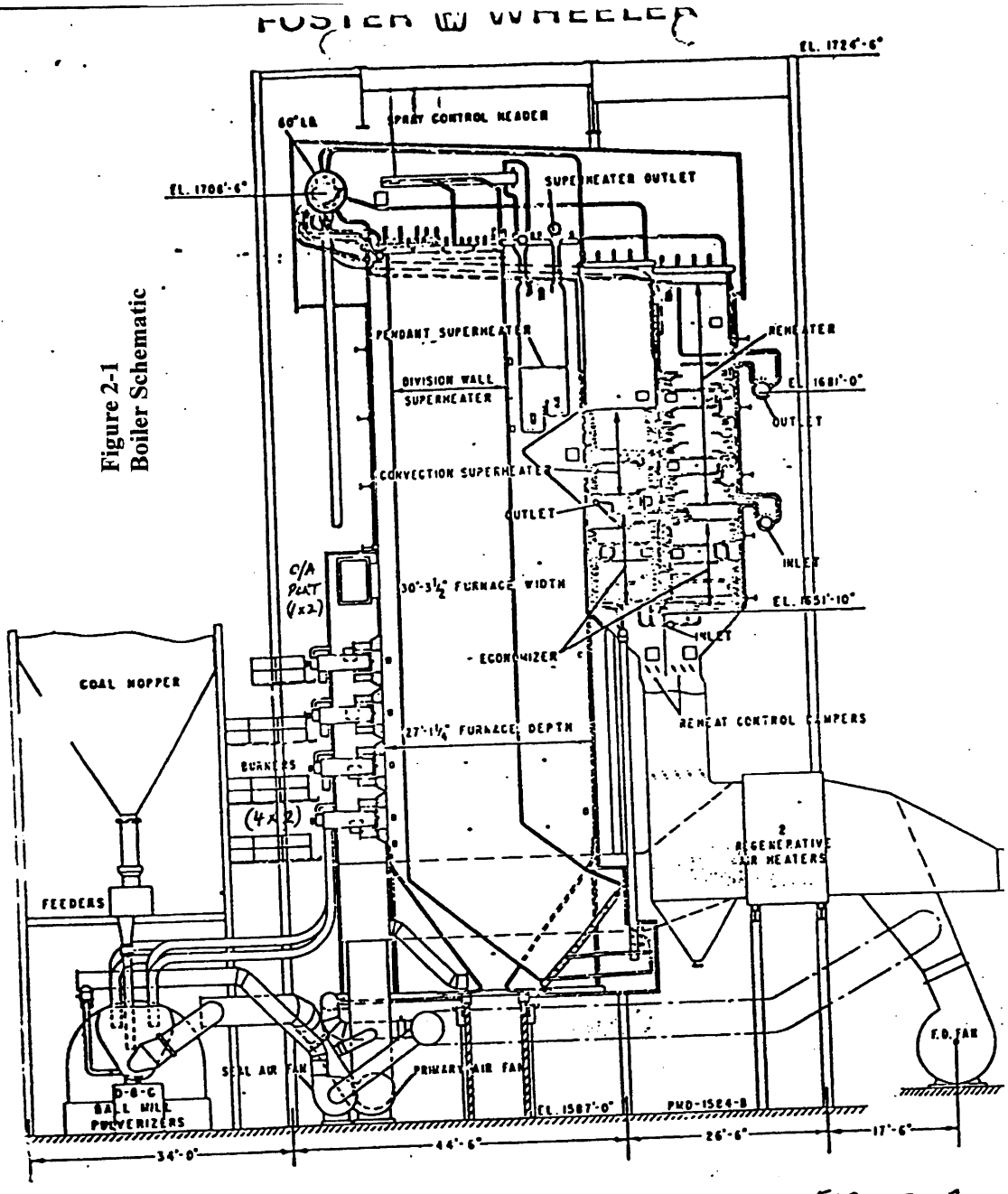


Figure 2-1
Boiler Schematic

FIGURE 2

Name ..... Nevada Power Company ..... Design Pressure ..2225/575 psig .....
Location ..... Moapa, Nev. - Reid Gardner Station - Unit No. 3 ..... Final Steam Temperature 1005/1005 F .....
No. of Units ....1... Contract No. 2-79-1514 ..... Date . November 1972 ..... Capacity 857.4 M lb/ hr Type .. Reheat .....

Figure 2-2
Process Flow Diagram

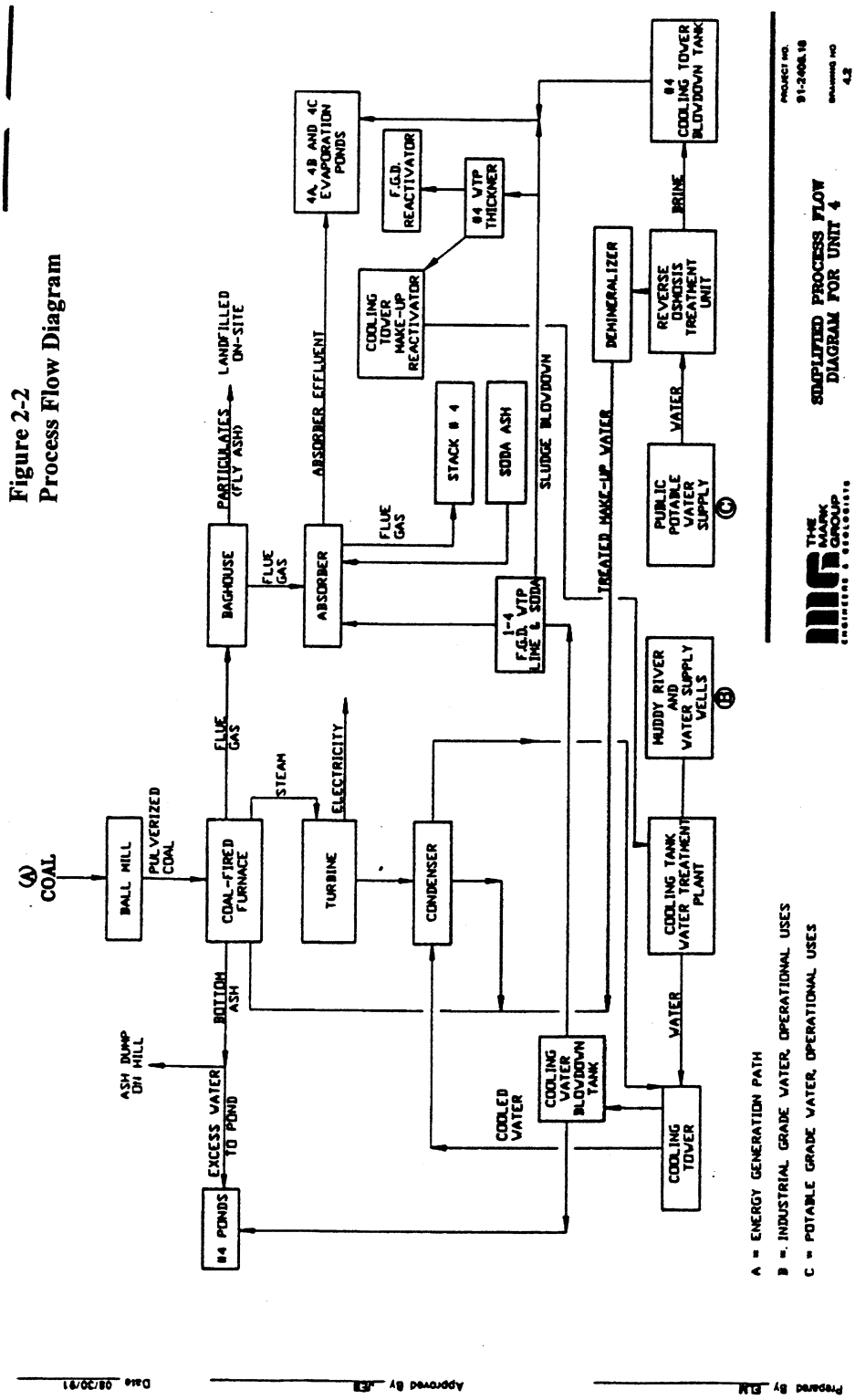
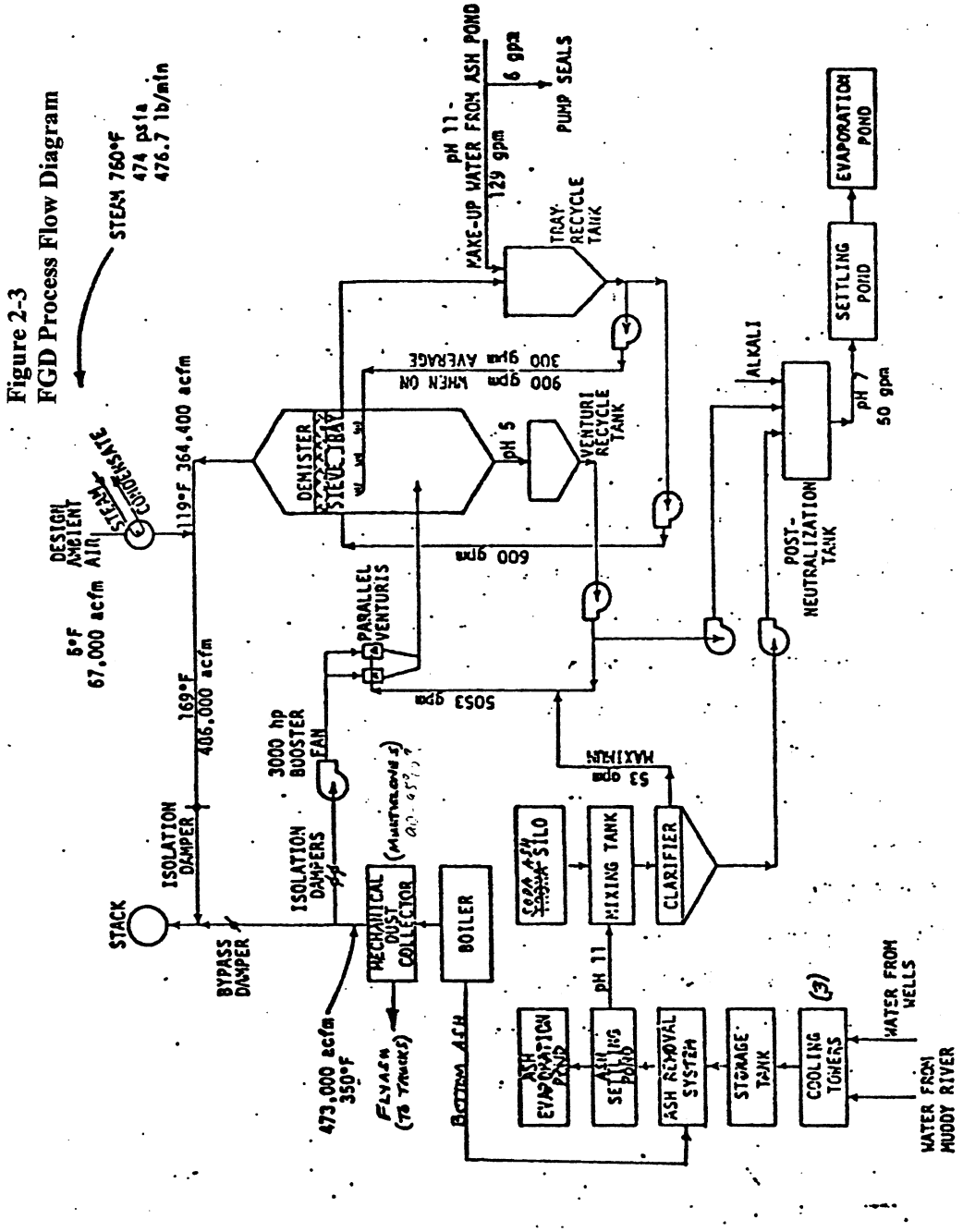


Figure 2-3
FGD Process Flow Diagram



2-2-1 RG-4 Coal Preparation and Combustion

As needed, coal is conveyed from the stockpile utilizing enclosed conveyors and (water) spray dust suppression to the RG-4 coal silos (8 total). The silos are normally loaded once per day with full load sometimes requiring two loading sequences per day. The coal passes from the silos into the first of two crushing processes

The first process consists of crushing the coal in a device referred to as a ball mill. RG-4 has two mills. For loads above minimum stable load (130 MW net), both mills are required to be in service. Each mill is comprised of a large drum where the coal is fed into a mix of heated air and various sized steel balls. The mix is turned in the drum that reduces the size of the coal particles to the point where they can be blown out with primary air.

The particles then undergo the second crushing or pulverizing process. In this process, the coal/air mixture is refined down to powder suitable for efficient combustion. RG-4 possesses four pulverizers operating two per ball mill.

After pulverization, the powdered coal/air is blown to the burner decks where it is injected into the boiler. The heat of combustion produces steam within the various boiler-tubes lining the firebox portion of the boiler. Steam is piped to a turbine generator where the thermal energy is converted to mechanical energy as the steam turns the turbine blades that rotate the turbine shaft. The motion of the turbine shaft directly coupled to an electrical generator produces an electrical current for transmission.

By products of the combustion process, flue gases and fly ash, flow out of the boiler and into mechanical fly ash collectors. Bottom ash that is too heavy to remain entrained in the gas stream is handled via bottom hoppers. Larger pieces or "clinkers" are crushed with internal crushers located inside of the boiler just above the bottom hoppers. These collectors are located within the boiler and do not vent to the atmosphere. From the bottom hoppers, the fly ash is transferred pneumatically to the fly ash silo where it is stored until it can be trucked to the fly ash landfill near the site.

Upon exiting the boiler, the hot flue gas and fly ash pass into a baghouse, where the flue gas is filtered through approximately 7,000 inverted bags. Each bag is 22 feet in length. These bag filters remove 99% of the entrained particulate matter. The ash collected is sequentially dropped into hoppers where it is pneumatically transported to the fly ash silo and trucked to the landfill.

Upon exiting the baghouse, the filtered flue gas stream is monitored for opacity prior to entering the wet scrubbing system. This is done to avoid condensation in the stack. The wet scrubbing system consists of 3 absorber cells, with each cell sized to accommodate 50% of unit load. Two cells are therefore required to be in service to support operation of the unit above minimum stable load. The third cell is kept in reserve should one active cell experience a failure.

The scrubber removes pollutants by passing the gases upward through a rain of a mildly caustic solution of soda ash and water (counterflow flue gas desulfurization or FGD). The soda ash and water mixture removes sulfur dioxide (SO_2) and particulate matter (PM) by droplet impingement. This mixture is repeatedly circulated until saturated. At saturation, it is piped into temporary storage tanks that hold the solution until it can be pumped to the wastewater ponds near the site.

Once the flue gas has been scrubbed, it passes out a 500-foot tall exhaust stack monitored identically to that of units #1-3. All pollution control device bypass gases are eventually returned to the stack.

2-2-2 RG-4 Water Treatment

Fresh water is brought into the plant from either the Muddy River or a water well field; both located in the Moapa Valley area. The water is temporarily stored in an on-site Raw Water Pond. As needed, water is transferred from the Raw Water Pond to the RG-4 Water Softening System. The water is treated to remove scaling minerals such as calcium carbonate and then sent to the Treated Water Reservoir. Water from the reservoir is used for cooling tower make-up. When the total dissolved solids in

the cooling, tower-circulating water elevates to the point of precipitation (or scaling); it is decanted to the FGD Lime Soda Softening Water Treatment System. This system is utilized to remove calcium carbonate from the tower blow-down water. Upon exiting from this system, the purified water is stored in the FGD Water Holding Tank until it is transferred added to FGD make-up water. Once the water is repeatedly circulated to the point of precipitation, it is decanted to the on-site evaporation ponds.

2-2-3 RG-4 Cooling Tower – (Particulate Matter)

Particulate emissions from cooling tower results from the evaporation of liquid drift and liberation of the formerly suspended solids in the tower re-circulation water. While the mechanism for these emissions is simplistic, actual quantification of on-site and off-site emissions and the fractionation of the particles is an exacting process which is highly dependent upon such day to day variables as drift rate, total dissolved solids, temperature, re-circulation flow rate, and meteorology. Because characterization of true particulate emissions is costly, and highly factor dependent, most commercial and industrial tower operators are reluctant to commit resources to perform such characterizations in the absence of regulatory emissions standards or limitations. Although EPA has approved an emissions calculation methodology in AP-42, the methodology is difficult to apply to many evaporative tower operating characteristics, and the method is classified in the lowest confidence level (E) of emissions factors in this listing.

2-2-4 RG-4 Fuel Storage and Transfer Systems

Reid Gardner Station possesses one large (860,000 gallon capacity) existing petroleum liquid storage vessel which contains fuel oil #2. The site also maintains two 10,000-gallon aboveground diesel storage tanks located in the unit #1-3 and unit #4 coal yards, and two 6,000-gallon underground diesel tanks near the site maintenance shop. The large diesel tank is utilized to provide secondary fuel to the boilers to facilitate startup and flame stabilization. In the near future NPC plans to install equipment to replace diesel as the secondary fuel for the site with natural gas from the nearby Kern River pipeline. It is assumed that storage of diesel fuel in this tank will continue in some capacity to allow for the existence of a backup secondary fuel source in case of interruption in the delivery of natural gas to the site. The remaining small diesel tanks serve as fueling sources for the coal yard bulldozers and for motor vehicle refueling.

2-2 Control Equipment Description

See sections 2-2-1, 2-2-2, and 2-2-3 above.

2-3 RG-4 Flue Gas and Process Sampling Locations

See section 1-1-2 above.

2-3-1 Inlet (Duct) Locations

The inlet samples were collected via a single port located on the side of the inlet (duct-B) duct and in the direct plane of flow. A description of the cross-section of the inlet port location is shown in Figure 2-4. The exact location of the test ports are very near the CEMS (SO_2 INLET) extraction ports. Keep in mind that Figure 2-4 is not to scale. This location does not meet the requirements of EPA Method 1. Mercury is primarily in the gaseous phase and is not impacted by uncertainties in gas flow and isokinetic sampling rate. Stratification of mercury species was not expected, and although the inlet location fails to meet Method 1 criteria for flow angle, there is little that can be reasonably done to correct it.

Sample traverse points for the inlet location have been selected according to Method 1, and amount to a twenty five (25) point traverse across the duct through a single port. This approach is considered consistent with the intent and data quality requirements of the ICR.]

RG-4 has two (baghouse outlet) ducts (ducts A & B) that merge prior to the scrubbers. Because of the number and location of these (baghouse outlet / scrubber inlet) ducts, it was not feasible to sample both ducts simultaneously with the stack sample without adding an additional sampling train and operating team. Because mercury speciation was not expected to be stratified, and because the cost of an additional crew was not considered consistent with the intent of the ICR, inlet sampling was conducted in one (duct-B) duct. This approach adequately characterized mercury speciation at the inlets.

Figure 2-4
Example Illustration of Inlet Sampling Location

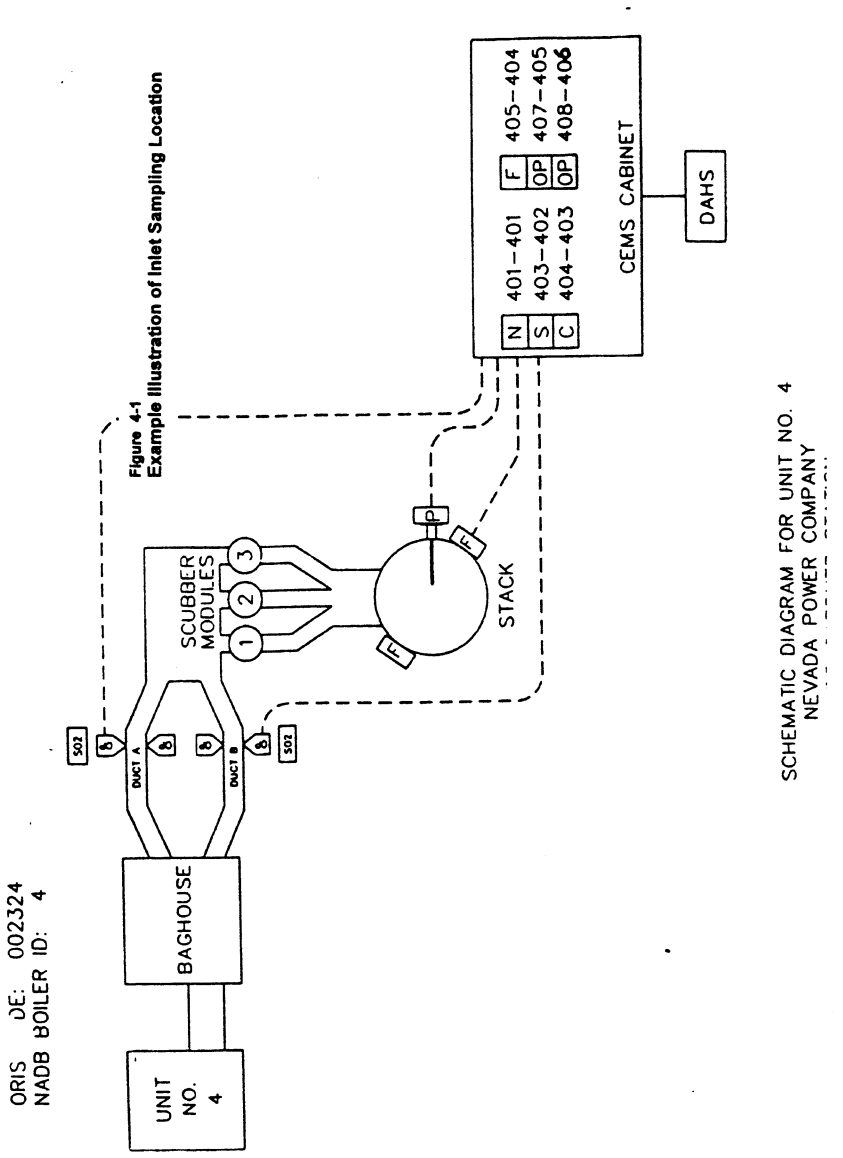


Table 2-1 presents a summary of key inlet and stack sample location parameters. Individual discussions of the two locations are presented below.

Table 2-1
Sampling Location Descriptions

Description	INLET: Rectangular duct from bag house to scrubber. OUTLET: Stack
Physical access:	INLET: Single sample port OUTLET: Four sample ports at 250-foot level of the stack
Side or top access:	INLET: Side OUTLET: Side
Round or rectangular:	INLET: Rectangular OUTLET: Round
Port length (outside to inner wall)	INLET: 12 inches OUTLET: 3 feet
Number & size of ports:	INLET: One port (six inch inside diameter) Nipple length: 1 foot. OUTLET: Four ports (six inch inside diameters)
Inside dimensions:	INLET: (Two identical rectangular ducts) 13 feet across and 24 feet 6 inches from top to bottom. OUTLET: (Round tapered stack) 21 feet across at the sampling ports.
Nearest upstream disturbance:	
Disturbance:	INLET: 45 degree bend OUTLET: 90-degree bend up the stack
Distance, ft:	INLET: (Narrowing of duct) six (6) feet upstream from sampling port. OUTLET: 225 feet (upstream)
Distance, diameters:	INLET: 1 diameter OUTLET: 8 diameters.
Nearest downstream disturbance:	INLET: 45 degree bend OUTLET: Stack exit
Distance, ft:	INLET: 20 feet OUTLET: 250 feet
Distance, diameters:	INLET: 1+ diameters OUTLET: 12 diameters

Table 2-1 Continued:

Approximate flue gas conditions:

Temperature, F	INLET: 324.54 F
	OUTLET: 144.45 degrees F
Moisture %:	INLET: 6.97%
	OUTLET: 11.5%
Flow rate, dscfm	INLET: 273,913.01
	OUTLET: 735,837.5
O2, % dry:	INLET: 3.9%
	OUTLET: 7.82%
CO2, % dry:	INLET: 15.08%
	OUTLET: 11.74%
Particulate gr/dscf:	INLET: N/A
	OUTLET: N/A
SO2 ppm:	INLET: 236 ppm
	OUTLET: 30 ppm
NOx ppm:	INLET: 200 ppm
	OUTLET: 175 ppm

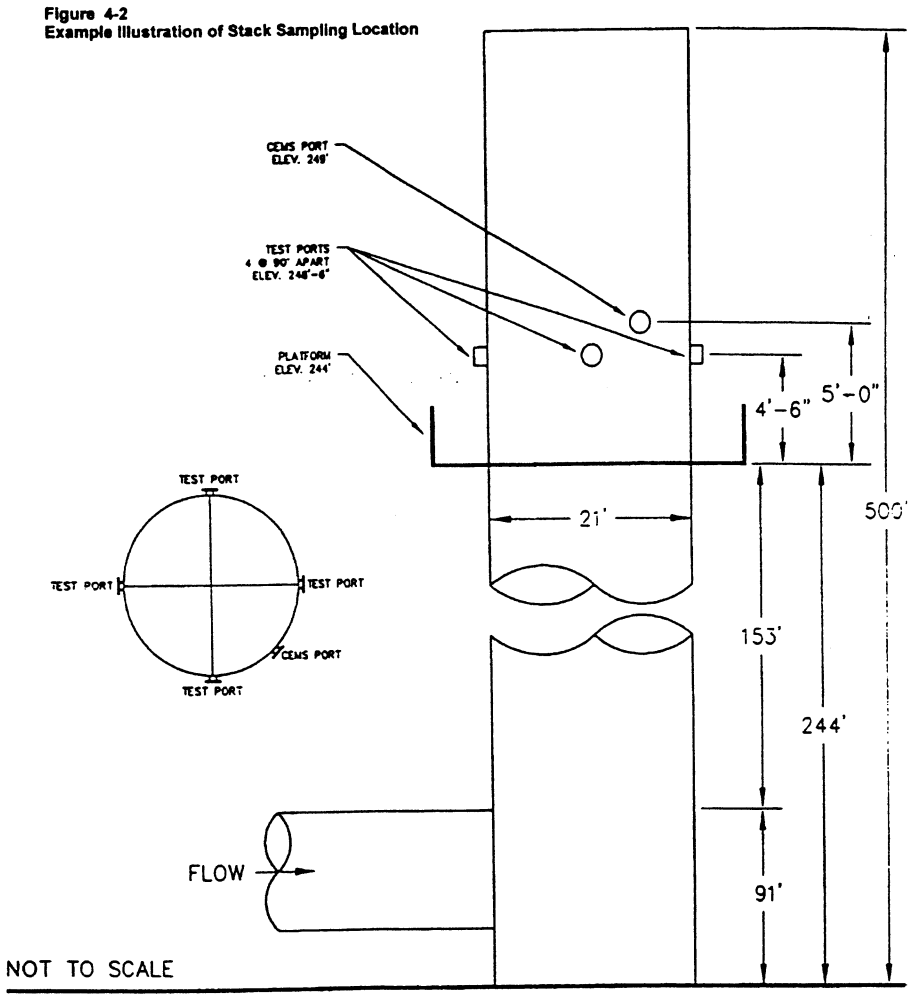
2-3-2 Outlet (Stack) Locations

The stack (exit) samples were collected at the existing (250') stack sample ports. A schematic and cross section of the stack location is shown in Figure 2-5.

This location satisfies the requirements of EPA Method 1.

The flue gas at the stack was 144 degrees F that is above the method specification of a minimum filtration temperature of 120°C. Therefore, external filtration per Method 5 was used, with a minimum probe and filter temperature of 120°C.

Figure 2-5
Example Illustration of Stack Sampling Location



CEMS SAMPLE LOCATIONS

NEVADA POWER COMPANY
REID GARDNER STATION UNIT NO. 4

2-3-3 Coal Sampling Location

Coal samples were collected in accordance with ASTM D2234 with a minimum of 15 incremental samples comprising each gross sample. The samples were collected as close to "as fired" status as possible. Coal samples were collected from each mill during each test run, and the mill samples collected during a test run were composted prior to analysis. See Appendix D

SPECIAL NOTE:

Fuel samples were collected from each mill ahead of the boiler. Inlet samples were collected at the inlet to the scrubbers. Outlet samples were collected at the stack (250' level) test ports.

The sample gas at the inlet was about 325 degrees F. At the stack, the gas temperature was approximately 144 degrees F.

Unit operation during testing remained at or near nominal full load, at steady state operation. Coal type, boiler operation, and control device operation all remained within normal operating ranges. Fuel was sampled and tested using appropriate ASTM methodology including heating value, sulfur, and ash content.

3

SUMMARY AND DISCUSSION OF RESULTS

3-1 Objectives and Test Matrix

The objective of the test program was to collect the information and measurements required by the EPA Mercury ICR. Specific objectives were to:

- Quantify speciated mercury emissions at the stack.
- Contemporaneously quantify speciated mercury concentrations in the flue gas at the inlet and the stack exit.
- Quantify fuel mercury and chlorine content during the stack and inlet tests.
- During the test period, obtain production rate and fuel analysis information that contribute to the end objectives of this testing
- Maintain RG-4 at normal and steady operation.
- Provide the above information for use in developing boiler, fuel, and control device specific-mercury-emission-factors.

The **TEST MATRIX** Is presented in Table 3-1 and includes a list of test methods used. In addition to speciated mercury, the flue gas measurements included moisture and stack gas flow.

Table 3-1
Test Matrix for Mercury ICR Tests at Reid Gardner Unit-4 (RG-4)

Sampling Location	No. of Runs	Species Measured	Sampling Method	Sample Run Time	Analytical Method	Analytical Laboratory
Stack	3	Speciated Hg	Ontario Hydro	120 min	Ontario Hydro	NEL
Stack	3	Moisture	EPA 4	Concurrent	Gravimetric	EHS
Stack	3	Gas Flow	EPA 1 & 2	Concurrent	Pitot Traverse	EHS
Stack	3	O_2/CO_2	EPA-3	N/A	Method 3	EHS
Stack	3	O_2	EPA-3	N/A	Method 3	EHS
Stack	3	CO_2	EPA-3	N/A	Method 3	EHS
Inlet	3	Speciated Hg	Ontario Hydro	125 min	Ontario Hydro	NEL
Inlet	3	Moisture	EPA 4	Concurrent	Gravimetric	EHS
Inlet	3	Gas Flow	EPA 1 & 2	Concurrent	Pitot Traverse	EHS
Inlet	3	O_2/CO_2	EPA-3	N/A	Method 3	EHS
Inlet	3	O_2	EPA-3	N/A	Method 3	EHS
Inlet	3	CO_2	EPA-3	N/A	Method-3	EHS
Coal Feeders	3	Hg, Cl in coal	Modified ASTM D2234	1 grab sample per mill per run	EPA SW 846: 7470 (Hg) 5050/9056 (Cl)	Wyoming Analitical

3-2 Field Test Changes and Problems

The only problems were associated with plant operations. RG-4 experienced a forced outage for repairs during testing activities.

Summary of Results

A summary of result measurements are listed in Table 1-1. (see page 1-2)

4

SAMPLING AND ANALYTICAL PROCEDURES

4-1 Emission Test Methods

This section contains a summary of the sampling and analytical procedures used to conduct the mercury speciation method required in EPA's ICR titled, "Standard Test Method for Elemental, Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources in compliance with the procedures outlined in the Ontario Method dated October 21, 1999. The full text of the Ontario Test Method is contained in Appendix G and the associated data is found within Appendix-A (Results & Calculations), Appendix-B (Raw Field Data & Calibration Data Sheets), and Appendix-D (Analytical Lab Records).

4-1-1 Sampling

Speciated mercury samples were collected in three test runs at the inlet and outlet of the last (scrubber) control device in compliance with the procedures outlined in the Ontario Method. The inlet and outlet sampling was concurrent. Field blanks and reagent blanks were collected as required by the method. Sampling logs and chain-of custody data is included within Appendix-C.

EPA methods to determine flue gas flow rate were used at both the Inlet and stack. EPA Reference Method 5 requirements for isokinetic sampling were followed. Each of the eight (8) impingers (impinger train) were weighed before and after sampling to determine flue gas moisture.

The probe and filter was heated to a minimum of 120°C.

Figure 4-1 presents a schematic of the mercury speciation sample train.

Table 4-1 presents the sample train components for the Method 5 configuration.

Figure 4-1
Schematic of the Mercury Speciation Sampling Train

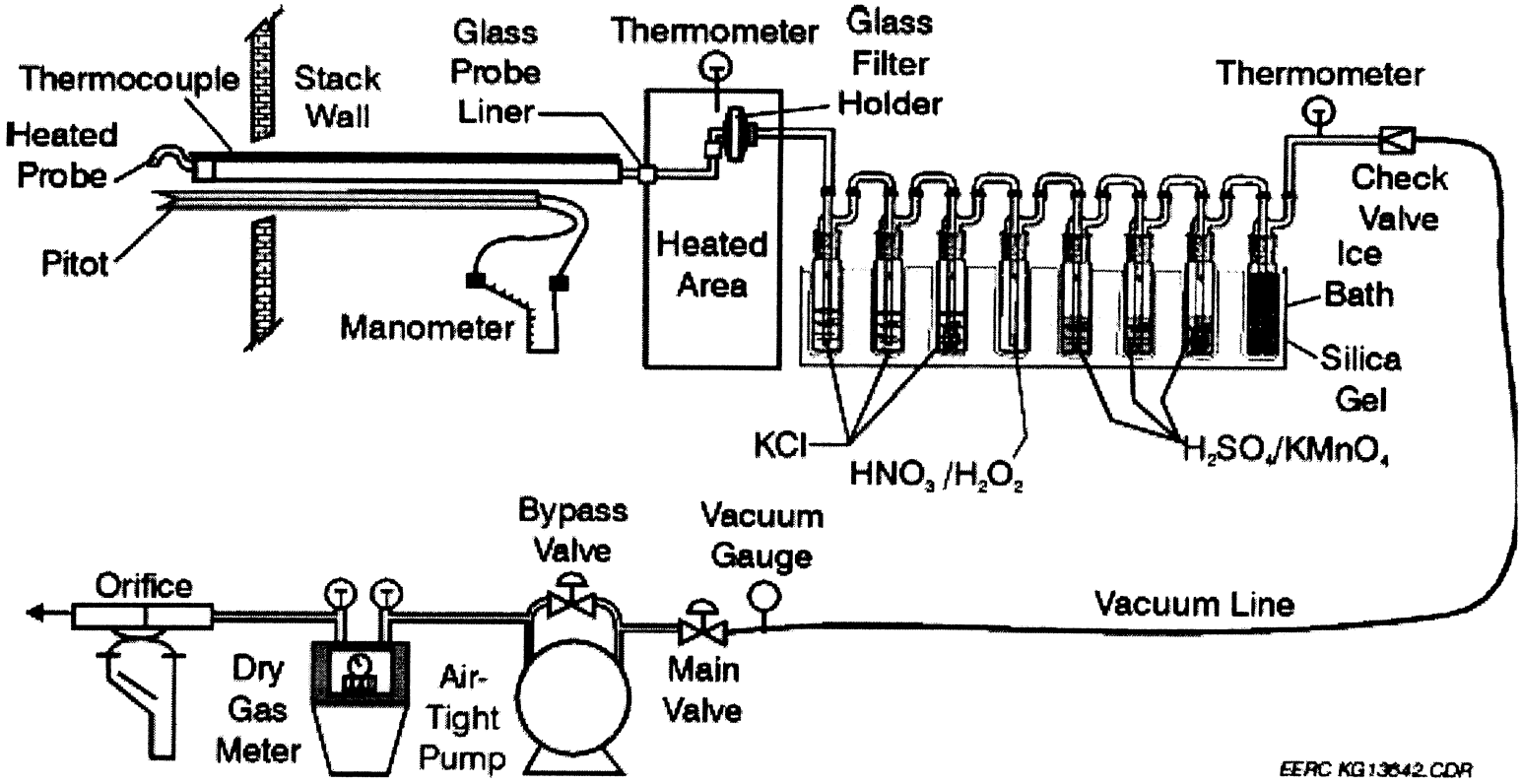


Table 4-1
Sample Train Components - Method 5 Configuration

Component	Details
Nozzle	Glass, quartz, or Teflon-coated stainless steel.
Probe	Glass, heated to minimum 120°C
Filter	Quartz, in glass or quartz holder, heated to stack temperature or 120°C, whichever is higher
Filter support	Glass, non-contaminating material
Impingers 1, 2	1 mol/l KCl solution; modified Smith Greenburg (SG) impinger
Impinger 3	1 mol/l KCl solution; standard Smith Greenburg impinger
Impinger 4	5% nitric acid/10% hydrogen peroxide; modified SG impinger
Impingers 5, 6	4% potassium permanganate/10% sulfuric acid; modified SG impinger
Impinger 7	4% potassium permanganate/10% sulfuric acid; standard SG impinger
Impinger 8	Silica gel; modified Smith Greenburg impinger

A sample was withdrawn from the flue gas stream isokinetically through the filtration system, which was followed by a series of impingers in an ice bath.

Particulate-bound mercury was collected on the front half (probe) and filter. Oxidized mercury was collected in three (3) impingers containing 1 N potassium chloride solution (impingers # 1, 2, 3). Elemental mercury was collected in one (1) impinger containing a 5% nitric acid and 10% peroxide solution (impinger # 4), and in three (3) impingers containing a solution of 10% sulfuric acid and 4% potassium permanganate (impingers # 5, 6, 7). One (1) impinger containing silica gel collected any remaining moisture (impinger # 8).

The filter media was quartz fiber filters. The filter holder was glass. A heated Teflon line was used.

A two-hour sampling time (125 minutes) was used, with a target sample volume of 1 to 2.5 standard cubic meters and in compliance with the procedures outlined in the Ontario Method (dated October 21, 1999). (see Appendix-A).

4-1-2 Sample Recovery

Sample recovery followed the procedures of section 13.2 of the Ontario Method. (Page 17 through 21). No variations of the Ontario Method sample recovery procedures were applied.

Figure 4-2 is a schematic of the sample recovery procedure for the impinger train.

Figure 4-2
Sample Recovery Procedures

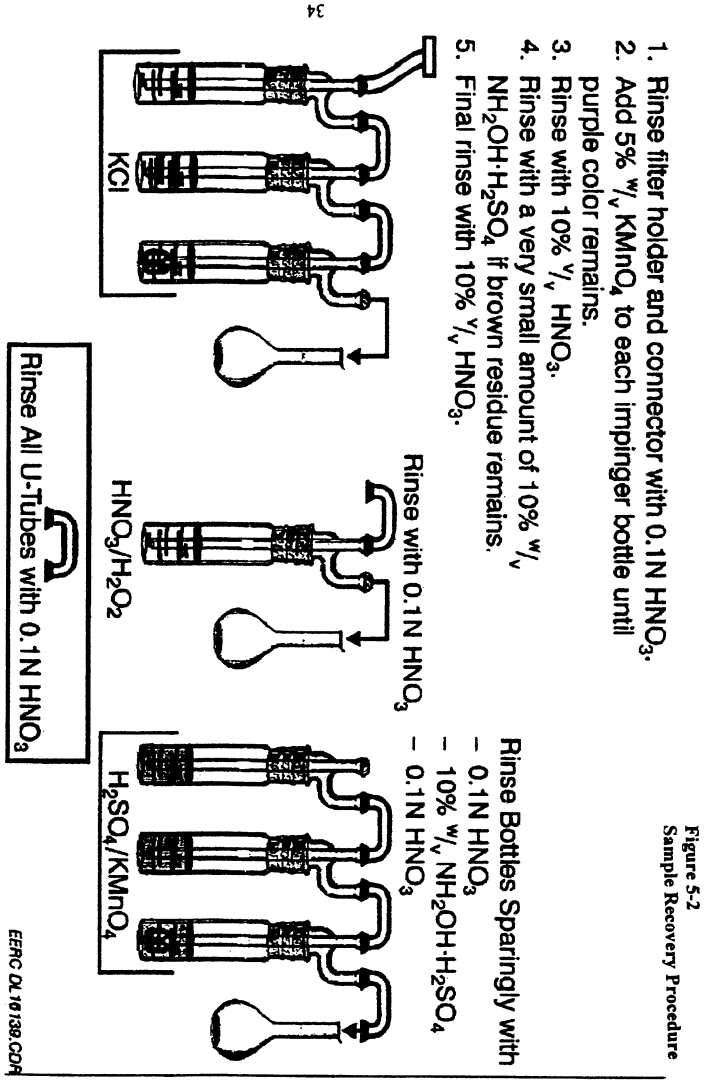


Figure 5-2
Sample Recovery Procedure

FIG. 3. Sample Recovery Scheme for the Mercury-Impinger Train

The samples were recovered into pre-cleaned glass bottles with vented Teflon lined lids for shipment to the laboratory. Note that the 8 N HCl referenced in the figure has been replaced in the latest version of the method with hydroxylamine sulfate. The following sample fractions were recovered and specific rinse solutions are contained in the method:

1. The sample filter;

2. The front half rinse (includes all surfaces upstream of the filter);

3. Impinger 1 through 3 (KCl impingers) and rinses;

4. Impinger 4 (HNO_3/H_2O_2 impinger) and rinses;

5. Impingers 5 through 7 ($KMnO_4/H_2SO_4$ impingers) and rinses;

6. Impinger 8 (silica gel impinger). Note this sample is weighed for moisture determination and is not included in the mercury analysis.

Figure 4-3 Sample Recovery (Particulate / Condensibles)

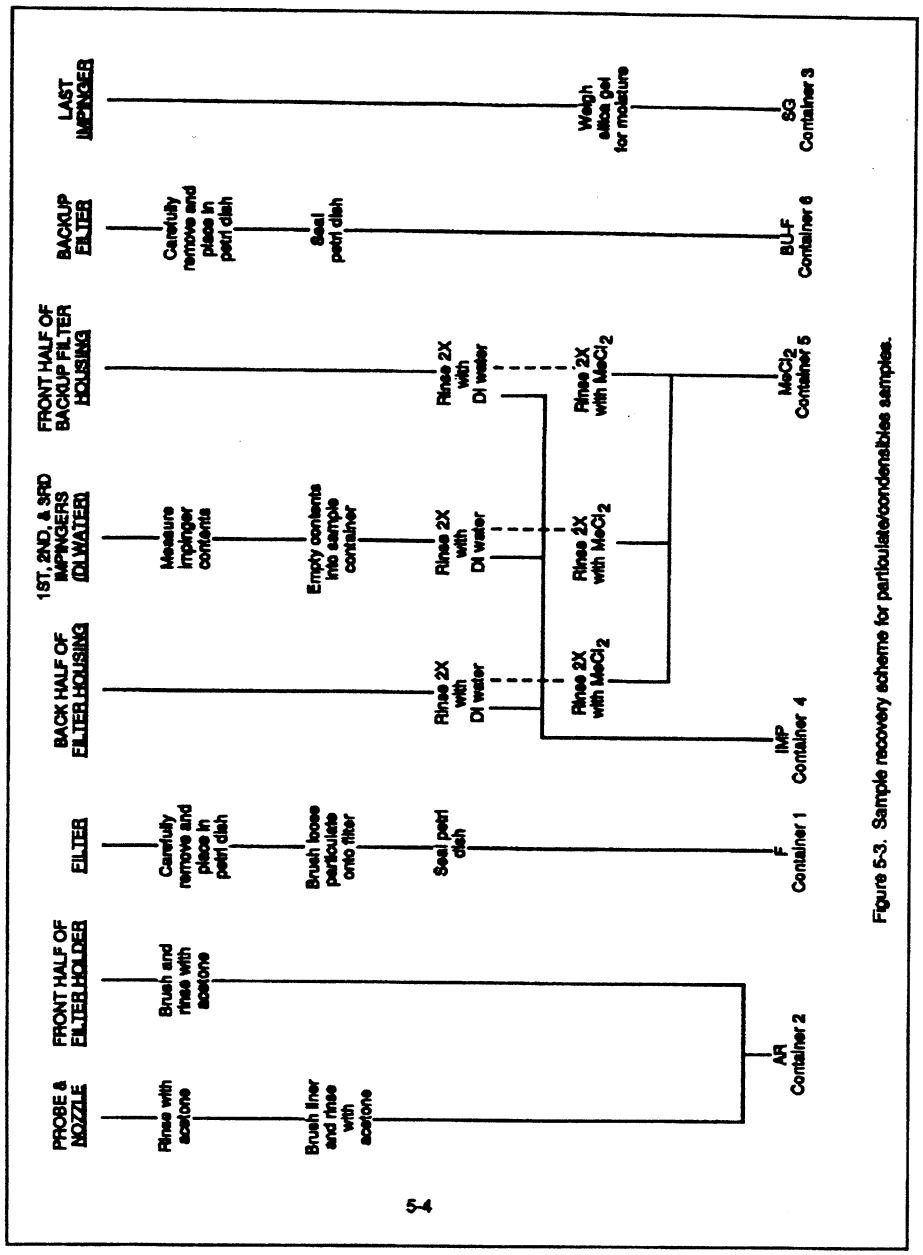


Figure 5-3. Sample recovery scheme for particulate/condensibles samples.

Figure 4-4 Sample Recovery (Particulate / Condensibles)

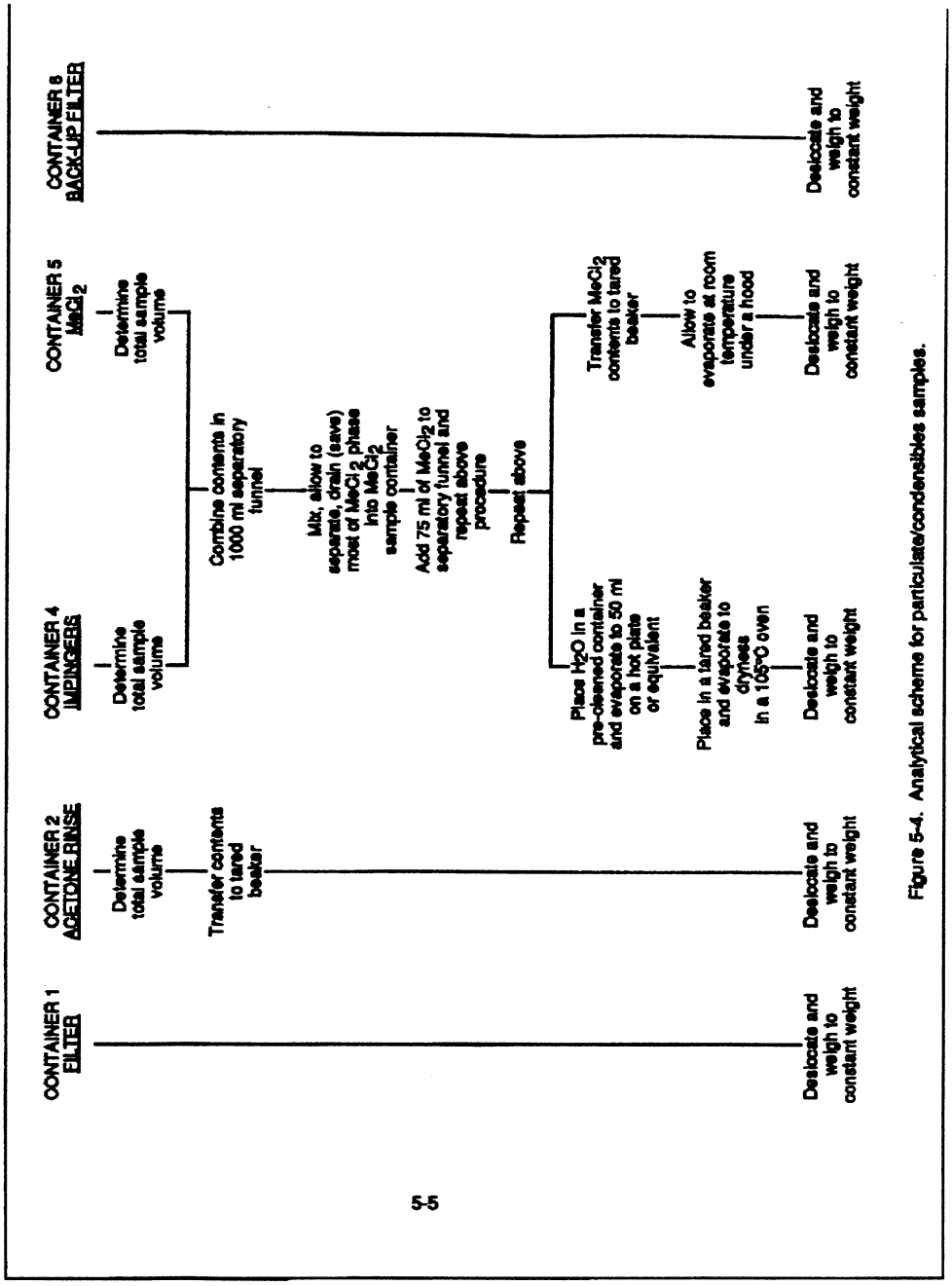


Figure 5-4. Analytical scheme for particulate/condensibles samples.

4-2 Sample Digestion and analysis (Data presented in Appendix-D)

The sample fractions were digested and analyzed in accordance with the specified procedures of the Ontario Method (October 21, 1999) and were summarized as follows:

Ash Sample (Containers 1 and 2) (see Appendix-D)

- If the particulate catch was greater than 1 gram (as would be the case at most particulate control device inlet locations), an aliquot of the particulate collected on the filter is digested by conventional methods.

KCl Impingers (Container 3) (see Appendix-D)

- The impingers were digested using H_2SO_4, HNO_3, and $KMnO_4$ solutions as specified in the method.

HNO_3-H_2O_2 (Container 4) (see Appendix-D)

- The impinger solution was digested using HCl and $KMnO_4$ solutions as specified in the method.

H_2SO_4-$KMnO_4$ Impingers (Container 5) (see Appendix-D)

- The impinger solution was digested using hydroxylamine sulfate as specified in the method.

Analysis

- Each digested fraction was analyzed in duplicate for total mercury by Cold Vapor Atomic Absorption (CVAAS). CVAAS is a method based on the absorption of radiation at 253.7 nm by mercury vapor. The mercury was reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passed through a cell positioned in the light path of an atomic absorption spectrometer. Mercury concentration was proportional to the indicated absorbency. A soda-lime trap and a magnesium perchlorate trap was used to precondition the gas before it entered the absorption cell.

4-3 Auxiliary Flue Gas Measurements

Auxiliary flue gas measurements performed were flue gas flow rate per EPA Methods 1 and 2 (pitot traverse), and dry gas molecular weight by Method 3. H_2O was measured by using EPA Method 4 (condensation/gravimetric analysis). These determinations were made for both the inlet and stack (outlet) locations.

4-3-1 Inlet Flow Determinations

There are typically higher uncertainties in gas flow measurements at the inlet location relative to the stack location due to non-axial flow. Flow was nevertheless determined using Method-2

4-4 Process Test Methods

4-4-1 Process Data

1. To the fullest extent possible, the data was collected using existing plant instrumentation and computerized log printouts. The objective of the process data collection was to assure and document normal boiler and air pollution control device operation.

2. Prior to and during each test the sampling team processed monitor data in conjunction with RG-4 operation station personnel, to assure that operating conditions remained within project target ranges.

The operation data collected is listed in Table 4-2.

Table 4-2
Process Data collected

Boiler Board Data	Run-1	Run-2	Run-3	Average
Unit Load MW, net	266	267	266	266.33
Steam Flow, klb/hr	2325	2320	2325	2323.33
Coal Mills in Service	3	3	3	3
Coal Flow, tons/hr.				
Exit gas temperature, F	146.02	141.81	145.44	144.45
CEMS DATA				
CO2 %, wet or dry	11.60	11.92	11.70	11.74
SO2, lb/MMBtu	0.0879	0.0853	0.0785	0.0839
NOx, lb/MMBtu	0.3288	0.3136	0.3648	0.3357
NO2, (if available)	N/A	N/A	N/A	N/A
Opacity, %	<1	<1	<1	<1
Stack Flow, klb/hr	253,110.58	282,761.39	285,867.05	273,913.01
FGD DATA				
SO2 at inlet, lb/MMBtu	0.7008	0.6286	0.7024	0.6773
SO2 at outlet, lb/MMBtu	0.0879	0.0785	0.0853	0.0839
Gas inlet temperature, F	339.3	316.4	321.2	325.6
Gas outlet temperature, F	146.0	141.9	145.4	144.4
FABRIC FILTER DATA				
Pressure drop, iwg	7.85	7.50	8.10	7.82
Outlet duct opacity, (if available)	2.35	2.20	2.30	2.28
Gas inlet temperature, F	N/A	N/A	N/A	N/A
Gas outlet temperature, F	339.3	316.4	321.2	325.6

4-5 Sample Identification and Custody (See Appendix-C)

Samples were collected and identified in accordance with written procedures.

Ash Sample (containers 1 & 2)

C1r1I	**Done**	Inlet probe filter for run # 1				4/19/2000	D.Ewing
C1r1s	**Done**	Stack probe filter for run # 1				4/19/2000	D.Ewing
C2r1I	**Done**	Inlet probe wash for run # 1				4/19/2000	D.Ewing
C2r1s	**Done**	Stack probe wash for run # 1				4/19/2000	D.Ewing

C1r2I	**Done**	Inlet probe filter for run # 2				4/20/2000	D. Ewing
`1r2s	**Done**	Stack probe filter for run # 2				4/20/2000	D. Ewing
..2r2I	**Done**	Inlet probe wash for run # 2				4/20/2000	D. Ewing
C2r2s	**Done**	Stack probe wash for run # 2				4/20/2000	D. Ewing
C1r3I	**Done**	Inlet probe filter for run # 3				4/25/2000	D. Ewing
C1r3s	**Done**	Stack probe filter for run # 3				4/25/2000	D. Ewing
C2r3I	**Done**	Inlet probe wash for run # 3				4/25/2000	D. Ewing
C21r3s	**Done**	Stack probe wash for run # 3				4/25/2000	D. Ewing

KCl Impingers (Container 3)

c3r1I	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 1				4/19/2000	D.Ewing
c3r1s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 1				4/19/2000	D.Ewing
C3r2I	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 2				4/20/2000	D. Ewing
C3r2s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 2				4/20/2000	D. Ewing
C3r3I	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 3				4/25/2000	D. Ewing
C3r3s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 3				4/25/2000	D. Ewing

HNO3-H2O2 (container 4)

C4r1I	**Done**	Inlet impinger # 4 contents (& rinse) from run #1				4/19/2000	D.Ewing
C4r1s	**Done**	Stack impinger # 4 contents (& rinse) from run #1				4/19/2000	D.Ewing
C4r2I	**Done**	Inlet impinger # 4 contents (& rinse) from run #2				4/20/2000	D. Ewing
C4r2s	**Done**	Stack impinger # 4 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c4r3I	**Done**	Inlet impinger # 4 contents (& rinse) from run # 3				4/25/2000	D. Ewing
`4r3s	**Done**	Stack impinger # 4 contents (& rinse) from run # 3				4/25/2000	D. Ewing

H2SO4-KMMnO4 (container 5)

c5r1I	**Done**	Inlet impingers # 5, 6,7 contents (& rinse) from run # 1				4/19/2000	D.Ewing
C5r1s	**Done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 1				4/19/2000	D.Ewing
C5r2I	**Done**	Inlet impingers # 5, 6, 7 contents (& rinse) from run # 2				4/20/2000	D. Ewing
C5r2s	**Done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c5r3I	**done**	Inlet impingers # 5, 6, 7 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c5r3s	**done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 3				4/25/2000	D. Ewing

5

QA/QC ACTIVITIES

5-1 QC Procedure

This section presents QA procedures to be used for the four key methods involved in the test program: (1) flow rate determination by EPA Methods 1 and 2, (2), O2 and CO2 concentrations were determined with the default values offered in Method 3, (3) flue gas sampling by EPA Method 5, and (4) sample recovery and analysis by the Ontario Hydro Method.

All relevant QA information is presented in the following tables and figures (note that the flue gas sampling per Methods 5/17 is a subset of the Ontario Hydro method activities):

1. Figure 5-1. Method 1 data sheet
2. Table 5-1. QC checklist and limits for Methods 1 and 2
3. Figure 5-2. Data Sheet for mercury sampling by Method 5
4. Figure 5-3. Chain of custody Form
5. Table 5-2. QC checklist and limits for Method 5 sampling
6. Table 5-3 QC checklist and limits for Ontario Hydro Mercury Speciation
7. Figure 5-4. Sample Label Example
8. Table 5-4. Audit samples for Ontario Hydro Mercury Speciation sampling.
9. Figure 5-5. Sample Log Sheet
10. These QA tables, along with a detailed list of recovery steps for each fraction, were posted in the test trailer/sample recovery area.

Figure 5-1
Method 1 Data Sheet

Sampling and Velocity Traverse Point Determination
EPA Method 1

PLANT NAME _____

CITY, STATE _____

SAMPLING LOCATION _____

NO. OF PORTS AVAILABLE _____

NO. OF PORTS USED _____

PORT INSIDE DIAMETER _____

DISTANCE FROM FAR WALL TO OUTSIDE OF PORT _____

NIPPLE LENGTH AND/OR WALL THICKNESS _____

DEPTH OF STACK OR DUCT _____

STACK OR DUCT WIDTH (IF RECTANGULAR) _____

EQUIVALENT DIAMETER:

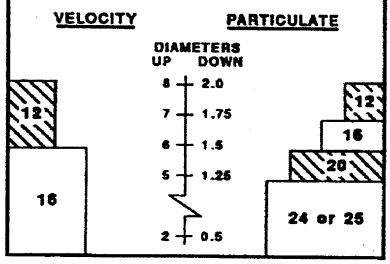
$D_E = \frac{2 \times \text{DEPTH} \times \text{WIDTH}}{\text{DEPTH} + \text{WIDTH}} = \frac{2 (\quad)(\quad)}{(\quad + \quad)} =$ _____

DISTANCE FROM PORTS TO FLOW DISTURBANCES	UPSTREAM	DOWNSTREAM
DIAMETERS	_____	_____

STACK/DUCT AREA = _____ = _____ IN^2
(must be > 113in.^{2})

DRAW HORIZONTAL LINE THROUGH DIAMETERS

If more than 8 and 2 diameters and if duct dia. is 12 - 24, use 8 or 9 points.



POINT	% OF DUCT DEPTH	DISTANCE FROM INSIDE WALL	DISTANCE FROM OUTSIDE OF PORT
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

LOCATION OF POINTS IN CIRCULAR STACKS OR DUCTS

	4	5	6	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF POINTS IN RECTANGULAR STACKS OR DUCTS

	3	4	5
1	16.7	12.5	10.0
2	50.0	37.5	30.0
3	83.3	62.5	50.0
4		87.5	70.0
5			90.0

Do not place points closer to stack walls than
1.0 in. for stack dia. >24 in.
0.5 in. for stack dia. 12 to <24 in.

For rectangular stacks, use only the following matrices:

No. Pts.	Matrix
9	3 x 3
12	4 x 3
16	4 x 4
25	5 x 5

Check for completeness_____

Checked by (Signature)_____

Figure 6-1
Method 1 Data Sheet

Table 5-1
QC Checklist and Limits for Methods 1 and 2

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Measurement site evaluation	>2 diameters downstream and 0.5 diameters upstream of disturbances	Method 1, Section 2.1
Pitot tube inspection	Inspect each use for damage, once per program for design tolerances	Method 2, Figures 2-2 and 2-3
Thermocouple	+/- 1.5% (°R) of ASTM thermometer, before and after each test mobilization	Method 2, Section 4.3
Barometer	Calibrate each program vs. mercury barometer or vs. weather station with altitude correction	Method 2, Section 4.4

Figure 5-2
Data Sheet for Mercury Sampling by Method 5

Date:_____ Run #: _____ Test Location:_____

Plant:_____

Operator: _____ Traverse Pt P in. H2O Stack Temp

tart time _____ 1

Pitot I.D. # _____ 2

Pitot coeff: CP = _____ 3

Last Calibration _____ 4

Pitot condition _____ 5

Guage sensitivity: _____ 6

Required in. H2O _____ 7

Actual in. H2O: _____ 8

Calibration: _____ 9

Pre Test: _____ 10

Post Test: _____ 11

Leak Check: _____ 12

Pre Test _____

Post Test _____

Temp I.D. # _____

Temp. Calibration: (1.5% abs _____

Pre-Test _____

Post-Test _____

Barometric Pressure Gauge Cal: _____

(0.1 in. Hg) _____

Pre-Test _____

Post Test: _____

Bp= _____

tatic Pressure = _____

Figure 5-3
Chain of Custody

CHAIN OF CUSTODY FORM

CLIENT: _____ TEST DATE(S): _____

LOCATION: _____ SAMPLER(S): _____

SAMPLE LOCATION: _____ PROJECT MANAGER: _____

TEST METHOD(S): _____ DATE DUE: _____

OUTSIDE LAB REQUIRED: _____ COMPLIANCE TEST: _____

DATE	TIME	TEST #	SAMPLE DESCRIPTION	CONTAINERS	SAMPLER	COMMENTS

RELEASED BY	DATE/TIME	RECEIVED BY	DATE/TIME

ANALYSIS REQUIRED: _____

_____

Table 5-2
QC Checklist and Limits for Method 5 Sampling

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Pre-mobilization checks		
Gas meter/orifice check	Before test series, Y_D +/- 5% (of original Y_D)	Method 5, Section 5.3
Probe heating system	Continuity and resistance check on element	
Nozzles	Note number, size, material	
Glassware	Inspect for cleanliness, compatibility	
Thermocouples	Same as Method 2	
On-site pre-test checks		
Nozzle	Measure inner diameter before first run	Method 5, Section 5.1
Probe heater	Confirm ability to reach temperature	
Pitot tube leak check	No leakage	Method 2, Section 3.1
Visible inspection of train	Confirm cleanliness, proper assembly	
Sample train leak check	$\leq$0.02 cf at 15" Hg vacuum	Method 5, Section 4.1.4
During testing		
Probe and filter temperature	Monitor and confirm proper operation	
Manometer	Check level and zero periodically	
Nozzle	Inspect for damage or contamination after each traverse	Method 5, Section 5.1
Probe/nozzle orientation	Confirm at each point	
Post test checks		
Sample train leak check	$\leq$0.02 cf at highest vacuum achieved during test	Method 5, Section 4.1.4
Pitot tube leak check	No leakage	Method 2, Section 3.1
Isokinetic ratio	Calculate, must be 90-110%	Method 5, Section 6
Dry gas meter calibration check	After test series, Y_D +/- 5%	Method 5, Section 5.3
Thermocouples	Same as Method 2	
Barometer	Compare w/ standard, +/- 0.1" Hg	

Table 5-3
QC Checklist and Limits for Ontario Hydro Mercury Speciation

Quality Control Activity	Acceptance Criteria and Frequency	Reference
Pre-mobilization activities		
Reagent grade	ACS reagent grade	Ontario Hydro Section 8.1
Water purity	ASTM Type II, Specification D 1193	Ontario Hydro Section 8.2
Sample filters	Quartz; analyze blank for Hg before test	Ontario Hydro Section 8.4.3
Glassware cleaning	As described in Method	Ontario Hydro Section 8.10
On-site pre-test activities		
Determine SO_2 concentration	If >2500 ppm, add more HNO_3-H_2O_2 solution	Ontario Hydro Section 13.1.13
Prepare KCl solution	Prepare batch as needed	Ontario Hydro Section 8.5
Prepare HNO_3-H_2O_2 solution	Prepare batch as needed	Ontario Hydro Section 8.5
Prepare H_2SO_4-$KMnO_4$ solution	Prepare for each test series-good for 48 hours	Ontario Hydro Section 8.5
Prepare HNO_3 rinse solution	Prepare batch as needed; can be purchased premixed	Ontario Hydro Section 8.6
Prepare hydroxylamine solution	Prepare batch as needed	Ontario Hydro Section 8.6
Sample recovery activities		
Brushes and recovery materials	No metallic material allowed	Ontario Hydro Section 13.2.6
Check for $KMnO_4$ Depletion	If purple color lost in first two impingers, repeat test with more HNO_3-H_2O_2 solution	Ontario Hydro Section 13.1.13
Probe cleaning	Move probe to clean area before cleaning	Ontario Hydro Section 13.2.1
Impinger 1,2,3 recovery.	After rinsing, add permanganate until purple color remains to assure Hg retention	Ontario Hydro Section 13.2.8
Impinger 5,6,7 recovery.	If deposits remain after HNO_3 rinse, rinse with hydroxylamine sulfate. If purple color disappears after hydroxylamine sulfate rinse, add more permangante until color returns	Ontario Hydro Section 13.2.10
Impinger 8	Note color of silica gel; if spent, regenerate or dispose	Ontario Hydro Section 13.2.11
Blank samples		
0.1 N HNO_3 rinse solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
KCl solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
HNO_3-H_2O_2 solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
H_2SO_4-$KMnO_4$ solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
Hydroxylamine sulfate solution	One reagent blank per batch.	Ontario Hydro Section 13.2.12
Unused filters	Three from same lot.	Ontario Hydro Section 13.2.12
Field blanks	One per set of tests at each test location.	Ontario Hydro Section 13.4.1
Laboratory activities		
Assess reagent blank levels	Target <10% of sample value or <10x instrument detection limit. Subtract as allowed.	Ontario Hydro Section 13.4.1
Assess field blank levels	Compare to sample results. If greater than reagent blanks or greater than 30% of sample values, investigate. Subtraction of field blanks not allowed.	Ontario Hydro Section 13.4.1
Duplicate/triplicate samples	All CVAAS runs in duplicate; every tenth run in triplicate. All samples must be within 10% of each other; if not, recalibrate and reanalyze.	Ontario Hydro Section 13.4.1

Figure 5-4

Sample Label

TEST SAMPLE

Client:_____

Project Name:_____

Test No.:_____ Method:_____

Sample I.D._____

_____ Media:_____

Sample Date:_____ Sample Time:_____

Field Sample Custodian:_____

Table 5-4
Audit Samples for Ontario Hydro Mercury Speciation

Audit Sample	Acceptance Criteria and Frequency	Reference
Known reagent spike	Every 10 samples	Ontario Hydro Section 13.4.1
Certified reference ash	One per program	Ontario Hydro Section 13.4.1

Figure 5-5
Sample Log Sheet

Figure 6-5
Sample Log Sheet

FIELD SAMPLE QUALITY CONTROL
50-CAPACITY CONTAINER, BOX NO. ________

Assembly Date ____________ Assembled By ____________ Job No. ____________

Plant Name/Address ____

Individual Tare Of Reagent ________ (mL)(gm) of ____________________

Individual Tare Of Reagent ________ (mL)(gm) of ____________________

Individual Tare Of Reagent ________ (mL)(gm) of ____________________

Individual Tare Of Sil. Gel ________ Gm ____________________
Other (specify)

Run/Sample I.D.	Samp. Method	Recovery Date	Recovery Time	Init	Run/Sample I.D.	Samp. Method	Recovery Date	Recovery Time	Init

All liqud levels at mark (check)? ___ Yes ___ No (estimate loss of not at mark; use REMARKS section).

Remarks ____

____

____

Custodian ____________________ Date ____________ Time ________

Q-1010 10-91 Figure 6-4. Example field sample quality control sheet.

6-7

5-2 QA/QC Checks for Data Reduction and Validation

5-2-1 Data Reduction

Data reduction occurred in two phases. First, preliminary data reduction occurred on the job site. On-site data reduction was performed by sampling personnel. Preliminary calculations include velocity, moisture, stack gas flow, sample gas volume, and percent isokinetic sampling. Calculations are generally performed automatically by the Method-5 computer. (see Appendix-A).

The second phase of data reduction occurred after the team had left the job site. This included review of the field data entry, and input of laboratory results to calculate speciated mercury concentrations.

5-2-2 Data Validation

All data, data entry, and calculations were-checked by the originator and reviewed by a second person. Reviews, in some instances, included recalculation (spot checks) of results, data entry checks, and calculation of known and accepted data sets using the existing computerized spreadsheets.

The inlet and outlet volumetric flowrates were compared on both trains.

Relative concentrations at inlet and outlet were compared for uniformity throughout testing.

5-3 Sample Identification and Custody

Chain of custody documentation was maintained on all data sheets and samples. An example chain of custody form is shown in Figure 5-3. Data is presented within Appendix-C.

Samples were identified with unique sample numbers and descriptive notations. Samples were stored in a locked area accessible only to test personnel.

Samples were stored and delivered with chain of custody documentation to NEL staff. This documentation included all transfer of samples including information concerning the method of sample delivery. The receiving laboratory documents the sample receipt and the sample condition are found in Appendix-C.

Data sheets were kept in the custody of the originator, program manager, or in locked storage until return to the office. The original data sheets were used for report preparation and any additions were initialed and dated.

Sample Recovery Areas

RG management provided an indoors clean environment area suitable as a sample recovery area. This area was situated nearby in an area as free as possible from ambient dust contamination and inside on the main floor of the FGD building near the testing locations.

APPENDICIES

APPENDIX-A

RESULTS AND CALCULATIONS

Summary of Results
Inlet Velocity & Flow Calculations
Inlet & Outlet Preliminary Calculations
Mercury Data Conversions

Summary of Results…

Table 1-1 Summary of Test Results

	RUN-1	RUN-2	RUN-3	AVERAGE
Test Date	4/19/2000	4/20/2000	4/24/2000	
Test Time	11:52 to 14:01	10:41 to 12:35	10:26 to 12:50	2+hours
Unit Operation				
Unit Load, MW net	266	267	266	266.33
Steam Flow, klb/hr	2325	2320	2325	2323.33
Coal Mills in Service	3	3	3	3
Coal Flow, tons/hr	120	120	120	120
SO2, lb/MMBtu	0.0879	0.0853	0.0785	0.0839
NOx, Lb/MMBtu	0.3288	0.3136	0.3648	0.3357
Opacity, %	<1	<1	<1	<1
Inlet Gas Properties				
Temperature, F	339.27	316.42	321.23	325.64
Gas Flow, dscfm	253,110.58	282,761.39	285,867.05	273,913.01
O_2, %	3.5	3.8	4.5	3.9
CO_2, %	15.30	15.23	14.70	15.08
Stack Gas Properties				
Temperature, F	146.02	141.89	145.44	144.45
Gas Flow, dscfm	740,314.8	711,367.1	755,830.7	735,837.5
O_2, %	7.90	7.66	7.90	7.82
CO_2, %	11.60	11.92	11.70	11.74
Inlet Mercury Speciation				
Particulate Mercury				
Ug/10^{12} Btu	6.039	12.54	0.075	6.218
Lb/10^{12} Btu	$1.329x10^{-8}$	$2.759x10^{-8}$	$1.651x10^{-10}$	$1.913x10^{-8}$
% of Total Hg	95.8	97.3	28.1	73.7
Oxidized Mercury				
Ug/10^{12} Btu	0.060	0.067	0.064	0.064
Lb/10^{12} Btu	$1.326x10^{-10}$	$1.479x10^{-10}$	$1.405x10^{-10}$	$5.640x10^{-10}$
% of Total Hg	0.96	0.52	23.95	8.48
Elemental Mercury				
Ug/10^{12} Btu	0.205	0.284	0.128	0.206
Lb/10^{12} Btu	$4.509x10^{-10}$	$6.254x10^{-10}$	$2.809x10^{-10}$	$4.524x10^{-10}$
% of Total Hg	3.25	2.20	47.90	17.78
Total Mercury				
Ug/10^{12} Btu	6.305	12.890	0.267	6.487
Lb/10^{12} Btu	$1.387x10^{-8}$	$2.837x10^{-8}$	$5.865x10^{-10}$	$1.97x10^{-10}$

Stack Mercury Speciation	RUN-1	RUN-2	RUN-3	AVERAGE
Particulate Mercury				
Ug/10^{12} Btu	0.094	0.094	0.095	0.043
Lb/10^{12} Btu	$2.076x10^{-10}$	$2.062x10^{-10}$	$2.089x10^{-10}$	$2.076x10^{-10}$
% of Total Hg	23.9	20.0	22.7	22.2
Oxidized Mercury				
Ug/10^{12} Btu	0.080	0.079	0.011	0.057
Lb/10^{12} Btu	$1.767x10^{-10}$	$1.740x10^{-10}$	$2.311x10^{-10}$	$1.939x10^{-10}$
% of Total Hg	20.30	16.85	25.12	20.76
Elemental Mercury				
Ug/10^{12} Btu	0.221	0.297	0.218	0.245
Lb/10^{12} Btu	$4.858x10^{-12}$	$6.525x10^{-12}$	$4.799x10^{-12}$	$5.394x10^{-12}$
% of Total Hg	55.84	63.18	52.17	57.06
Ug/10^{12} Btu	0.396	0.469	0.418	0.428
Lb/10^{12} Btu	$8.701x10^{-10}$	$1.033x10^{-9}$	$9.199x10^{-10}$	$6.001x10^{-10}$
Boiler Board Data				
Unit Load MW, net	266	267	266	266.33
Steam Flow, klb/hr	2325	2320	2325	2323.33
Coal Mills in Service	3	3	3	3
Coal Flow, tons/hr.	120	120	120	120
Exit gas temperature, F	146.02	141.89	145.44	144.45
CEMS DATA				
CO2 %, wet or dry	11.60	11.92	11.70	11.74
SO2, lb/MMBtu	0.0879	0.0853	0.0785	0.0839
NOx, lb/MMBtu	0.3288	0.3136	0.3648	0.3357
NO2, (if available)	N/A	N/A	N/A	N/A
Opacity, %	<1	<1	<1	<1
Stack Flow, klb/hr	253,110.58	282,761.39	285,867.05	273,913.01
FGD DATA				
SO2 at inlet, lb/MMBtu	0.7008	0.6286	0.7024	0.6773
SO2 at outlet, lb/MMBtu	0.0879	0.0785	0.0853	0.0839
Gas inlet temperature, F	339.3	316.4	321.2	325.6
Gas outlet temperature, F	146.0	141.9	145.4	144.4
FABRIC FILTER DATA				
Pressure drop, iwg	7.85	7.50	8.10	7.82
Outlet duct opacity, (if available)	2.35	2.20	2.30	2.28
B.H. Gas inlet temperature, F	N/A	N/A	N/A	N/A
B.H. Gas outlet temperature, F	339.3	316.4	321.2	325.6

Inlet Velocity & Flow Calculations

Reid Gardner Mercury Test Inlet Velocity and Flow Calculations

	Velocity	Kp	cp	^p	Tsavg	Ps	Baro	Ms
Inlet Run 1	**44.63**	85.49	0.84	0.397	799.27	27.39	28.56	30

	Flow	Bws	vs	Area	Tstd	Tsavg		Ps	Pstd
	15186634.59	0.075	44.62726	169	528	799.27		27.39	29.92
	253110.58								

	Velocity	Kp	cp	^p	Tsavg	Ps	Baro	Ms
Inlet Run 2	**48.55**	85.49	0.84	0.483	776.42	27.35	27.9	30

	Flow	Bws	vs	Area	Tstd	Tsavg		Ps	Pstd
	16965683.45	0.076	48.54866	169	528	776.42		27.35	29.92
	282761.39								

	Velocity	Kp	cp	^p	Tsavg	Ps	Baro	Ms
Inlet Run 3	**47.44**	85.49	0.84	0.468	781.23	27.93	28.55	30

	Flow	Bws	vs	Area	Tstd	Tsavg		Ps	Pstd
	17152023.20	0.058	47.44	169	528	781.23		27.93	29.92
	285867.05								

3-run Flow Average= **273913.01**

Example Calculation Velocity = Kp * Cp * (sqrt delta P) * (sqrt (Ts average / (Ps * Ms)))

85.49 * 0.84 * (sqrt 0.397) * (sqrt (799.27 / (27.39 * 30)))

44.63 ft/sec.

Example Calculation Flow = 3600 * (1 - Bws) * vs * A * (Tstd / Tstack) * (Pstack / Pstd)

3600 * (1 - 0.075) * 44.63 * 169 * (528 / 799.27) * (27.39 / 29.92)

15186634.59 dscfh

253110.58 dscfm

Inlet & Outlet Preliminary Calculations

C011

PRELIMINARY CALCULATIONS

Plant Site: Reid Gardner Station
Sampling Location: Inlet

Date: 04/19/2000
Stack ID (in): 174.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.130
V2	Final meter reading	dcf	73.418
Vm	Volume dry gas, meter conditions	dcf	73.288
PBar	Barometric pressure	in Hg	28.56
DH	Average orifice pressure drop	in H2O	1.44
Tm	Average meter temperature	½F	117.243
Vmstd	Volume dry gas, standard conditions	dscf	64.324
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.075
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	29.10
DPs	Average stack gas velocity head	inH2O	0.397
Ts	Average stack temperature	½F	339.27
Ps	Stack pressure, absolute	in Hg	0.00
Vs	Average stack gas velocity	ft/sec	0.00
ID	Inside stack diameter	in	174.00
As	Stack area	in2	23778.72
Qs	Stack flowrate, dry standard conditions	dscfh	0.00
TT	Net time of run	min	125.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		0.00
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

C011

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
Sampling Location: Inlet

Date: 04/19/2000
Stack ID (in): 174.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	5.0	2.807	3.80	0.380	1.395	108.23	110.56	285.77	249.95	59.12
2	10.0	5.709	3.90	0.381	1.438	109.27	111.49	310.62	248.65	53.99
3	15.0	8.659	3.90	0.391	1.452	110.57	112.67	307.69	248.27	56.11
4	20.0	11.584	3.90	0.386	1.437	111.84	113.70	309.74	252.03	58.83
5	25.0	14.512	3.90	0.384	1.438	112.95	114.58	313.10	246.52	59.84
6	30.0	17.337	3.90	0.357	1.400	113.99	115.50	313.92	243.83	61.22
7	35.0	20.283	4.00	0.398	1.441	114.92	116.33	331.47	251.35	62.19
8	40.0	23.220	4.00	0.394	1.443	115.73	116.93	332.44	251.69	63.00
9	45.0	26.085	3.90	0.371	1.412	116.29	117.40	329.82	243.12	64.46
10	50.0	29.059	4.00	0.405	1.456	116.87	117.93	337.37	244.29	65.48
11	55.0	32.063	4.00	0.411	1.466	117.61	118.64	343.03	251.06	66.71
12	60.0	35.105	4.10	0.426	1.482	118.18	119.18	343.63	249.21	65.89
13	65.0	38.133	4.10	0.417	1.473	118.50	119.42	344.85	247.05	62.00
14	70.0	41.151	4.10	0.423	1.473	118.79	119.76	350.91	249.46	58.73
15	75.0	44.172	4.10	0.423	1.474	119.06	119.98	354.00	250.09	59.06
16	80.0	47.140	4.10	0.408	1.452	119.12	120.04	352.50	247.76	59.48
17	85.0	50.076	4.00	0.399	1.441	119.17	120.09	351.68	249.65	59.60
18	90.0	53.042	4.10	0.408	1.454	119.11	119.99	354.05	249.16	60.50
19	95.0	55.939	4.00	0.386	1.423	119.12	119.99	356.70	248.41	61.42
20	100.0	58.785	4.00	0.376	1.409	119.18	120.06	351.53	249.62	60.00
21	105.0	61.712	4.00	0.403	1.435	119.25	120.10	360.96	249.33	60.14
22	110.0	64.575	4.00	0.381	1.413	119.39	120.26	357.77	248.57	60.97
23	115.0	67.412	4.00	0.378	1.407	119.42	120.18	364.06	250.21	61.24
24	120.0	70.442	4.20	0.430	1.479	119.72	120.43	363.54	249.26	60.83
25	125.0	73.418	4.10	0.411	1.457	120.02	120.66	360.66	249.67	61.21

C011

METHOD 5 DATA SUMMARY

ct: Mercury Test Report
Site: Reid Gardner Station
Sampling Location: Inlet
Site ID: 4:
Reported By: 1

Remarks:
Inlet, Run #1

Run Number: 1
Date: 04/19/2000

Stack Gas Temperature Ts (½F): 339.27

Moisture Content Bws: 0.075

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 29.10

Absolute Gas Pressure Ps (in Hg): 0.00

Gas Velocity Pressure delta P avg (in H20): 0.397

sqrt(delta p) avg.: 0.630

Gas Velocity Vs (ft/sec): 0.00

Gas Flow Rate Qs (ft3/hr): 0.00

culate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 0.00

PRELIMINARY CALCULATIONS

Plant Site: Reid Gardner Station Date: 04/20/2000
Sampling Location: Inlet Stack ID (in): 174.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.139
V2	Final meter reading	dcf	80.048
Vm	Volume dry gas, meter conditions	dcf	79.909
PBar	Barometric pressure	in Hg	27.90
DH	Average orifice pressure drop	in H2O	1.57
Tm	Average meter temperature	½F	103.919
Vmstd	Volume dry gas, standard conditions	dscf	70.163
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.076
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	29.09
DPs	Average stack gas velocity head	inH2O	0.483
Ts	Average stack temperature	½F	316.42
Ps	Stack pressure, absolute	in Hg	0.00
Vs	Average stack gas velocity	ft/sec	0.00
ID	Inside stack diameter	in	174.00
As	Stack area	in2	23778.72
Qs	Stack flowrate, dry standard conditions	dscfh	0.00
TT	Net time of run	min	125.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		0.00
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
›ling Location: Inlet

Date: 04/20/2000
Stack ID (in): 174.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	5.0	2.096	3.50	0.421	1.429	89.74	92.53	263.53	249.79	57.77
2	10.0	5.961	3.50	0.430	1.503	92.15	94.85	281.45	247.21	53.79
3	15.0	9.043	3.50	0.433	1.507	94.38	97.22	285.76	249.96	57.22
4	20.0	12.089	3.60	0.428	1.491	96.23	98.75	283.73	249.37	59.85
5	25.0	15.095	3.50	0.415	1.477	97.83	100.28	291.12	248.15	62.14
6	30.0	18.025	3.40	0.398	1.442	99.33	101.65	307.05	250.92	63.29
7	35.0	20.991	3.40	0.408	1.459	99.92	102.06	299.29	247.77	63.19
8	40.0	24.124	3.90	0.456	1.543	100.79	102.42	306.96	250.11	63.79
9	45.0	27.419	3.80	0.502	1.616	102.04	103.56	307.77	249.58	64.63
10	50.0	30.719	3.90	0.505	1.617	103.18	104.64	314.74	249.72	63.73
11	55.0	34.132	4.00	0.540	1.684	105.05	106.47	314.64	247.88	60.80
12	60.0	37.625	4.10	0.570	1.738	105.59	107.07	317.27	248.07	60.07
13	65.0	41.039	4.00	0.551	1.683	105.11	106.57	327.58	253.74	60.01
14	70.0	44.399	4.00	0.535	1.654	105.90	107.04	324.85	245.17	60.06
15	75.0	47.756	4.00	0.536	1.651	106.83	107.83	327.62	247.55	60.17
16	80.0	51.076	3.90	0.523	1.632	107.05	108.14	332.54	252.43	60.65
17	85.0	54.236	3.80	0.472	1.537	107.94	108.76	336.14	247.83	61.25
18	90.0	57.521	3.90	0.504	1.605	108.21	108.99	327.14	249.52	60.50
19	95.0	60.509	3.60	0.429	1.459	108.16	109.55	339.80	251.18	58.17
20	100.0	63.529	3.60	0.431	1.481	107.71	109.17	335.58	247.74	57.56
21	105.0	66.584	3.70	0.444	1.501	106.87	108.04	335.99	248.49	57.93
22	110.0	69.894	4.00	0.520	1.625	107.20	108.50	337.04	251.94	57.74
23	115.0	73.284	4.00	0.538	1.661	107.46	107.99	332.02	248.52	58.21
24	120.0	76.720	4.10	0.559	1.696	107.32	107.31	336.40	247.36	59.10
25	125.0	80.048	4.00	0.536	1.634	107.41	107.14	344.61	252.60	59.67

C011

METHOD 5 DATA SUMMARY

Project: Mercury Test Report
Site: Reid Gardner Station
Sampling Location: Inlet
Site ID: 4:
Reported By: 1

Remarks:
Inlet, Run #2

Run Number: 1
Date: 04/20/2000

Stack Gas Temperature Ts (½F): 316.42

Moisture Content Bws: 0.076

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 29.09

Absolute Gas Pressure Ps (in Hg): 0.00

Gas Velocity Pressure delta P avg (in H2O): 0.483

sqrt(delta p) avg.: 0.694

Gas Velocity Vs (ft/sec): 0.00

Gas Flow Rate Qs (ft3/hr): 0.00

Particulate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 0.00

C011

PRELIMINARY CALCULATIONS

nt Site: Reid Gardner Station
ling Location: Inlet

Date: 04/25/2000
Stack ID (in): 174.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.134
V2	Final meter reading	dcf	78.154
Vm	Volume dry gas, meter conditions	dcf	78.020
PBar	Barometric pressure	in Hg	28.55
DH	Average orifice pressure drop	in H2O	1.55
Tm	Average meter temperature	½F	99.865
Vmstd	Volume dry gas, standard conditions	dscf	70.597
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.058
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	29.30
DPs	Average stack gas velocity head	inH2O	0.468
Ts	Average stack temperature	½F	321.23
Ps	Stack pressure, absolute	in Hg	0.00
Vs	Average stack gas velocity	ft/sec	0.00
ID	Inside stack diameter	in	174.00
As	Stack area	in2	23778.72
Qs	Stack flowrate, dry standard conditions	dscfh	0.00
TT	Net time of run	min	125.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		0.00
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

C011

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
Sampling Location: Inlet

Date: 04/25/2000
Stack ID (in): 174.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	5.0	2.811	4.10	0.434	1.405	83.88	85.48	274.64	246.93	58.82
2	10.0	5.866	4.50	0.448	1.528	85.01	86.40	297.21	251.58	55.62
3	15.0	8.834	4.30	0.422	1.486	86.14	87.21	297.47	247.07	57.18
4	20.0	11.870	4.50	0.444	1.516	87.24	88.22	300.90	248.90	58.89
5	25.0	14.868	4.40	0.430	1.498	89.07	90.12	300.44	251.15	59.69
6	30.0	17.882	4.40	0.428	1.497	91.45	92.42	300.79	248.57	59.89
7	35.0	20.884	4.40	0.428	1.484	93.89	94.66	302.57	250.87	60.49
8	40.0	24.027	4.60	0.467	1.548	95.95	96.40	306.20	249.68	61.21
9	45.0	27.107	4.50	0.454	1.513	97.70	97.94	318.00	249.87	61.35
10	50.0	30.419	4.80	0.514	1.645	99.50	99.84	304.03	248.99	59.00
11	55.0	33.471	4.50	0.440	1.506	101.18	101.73	326.25	251.03	58.87
12	60.0	36.423	4.40	0.417	1.465	101.47	102.09	328.60	250.06	59.60
13	65.0	39.442	4.50	0.433	1.487	102.33	103.10	328.23	248.86	60.27
14	70.0	42.781	4.90	0.530	1.658	103.28	104.03	327.96	251.16	60.44
15	75.0	46.029	4.70	0.495	1.597	104.34	104.93	326.30	248.87	61.17
16	80.0	49.302	4.80	0.506	1.611	105.25	105.90	331.99	248.96	60.42
17	85.0	52.562	4.70	0.508	1.600	105.26	105.74	333.59	252.52	57.69
18	90.0	55.878	4.80	0.518	1.632	105.57	105.80	330.91	244.57	57.13
19	95.0	59.123	4.80	0.501	1.592	106.09	106.17	340.35	253.20	57.79
20	100.0	62.408	4.80	0.514	1.612	106.73	106.76	339.01	250.39	58.60
21	105.0	65.665	4.80	0.502	1.595	107.04	107.03	334.84	243.36	59.09
22	110.0	68.864	4.80	0.491	1.568	107.33	107.35	347.69	254.49	59.79
23	115.0	72.021	4.70	0.481	1.559	107.56	107.74	342.23	250.16	59.31
24	120.0	75.179	4.70	0.476	1.561	107.74	108.19	336.34	244.20	56.68
25	125.0	78.154	4.50	0.427	1.469	108.19	108.80	354.13	252.96	57.38

C011

METHOD 5 DATA SUMMARY

'ct: Mercury Test Report
Site: Reid Gardner Station
Sampling Location: Inlet
Site ID: 4:
Reported By: 1

Remarks:
Inlet, Run #3

Run Number: 1
Date: 04/25/2000

Stack Gas Temperature Ts (½F): 321.23

Moisture Content Bws: 0.058

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 29.30

Absolute Gas Pressure Ps (in Hg): 0.00

Gas Velocity Pressure delta P avg (in H2O): 0.468

sqrt(delta p) avg.: 0.684

Gas Velocity Vs (ft/sec): 0.00

Gas Flow Rate Qs (ft3/hr): 0.00

culate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 0.00

C011

PRELIMINARY CALCULATIONS

Plant Site: Reid Gardner Station Date: 04/19/2000
ling Location: Stack Stack ID (in): 252.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.034
V2	Final meter reading	dcf	95.924
Vm	Volume dry gas, meter conditions	dcf	95.890
PBar	Barometric pressure	in Hg	28.56
DH	Average orifice pressure drop	in H2O	2.42
Tm	Average meter temperature	½F	82.737
Vmstd	Volume dry gas, standard conditions	dscf	89.738
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.117
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	28.60
DPs	Average stack gas velocity head	inH2O	0.612
Ts	Average stack temperature	½F	146.02
Ps	Stack pressure, absolute	in Hg	28.62
Vs	Average stack gas velocity	ft/sec	48.34
ID	Inside stack diameter	in	252.00
As	Stack area	in2	49875.93
Qs	Stack flowrate, dry standard conditions	dscfh	44418888.00
TT	Net time of run	min	120.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		102.64
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

C011

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
'ing Location: Stack

Date: 04/19/2000
Stack ID (in): 252.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	10.0	7.862	3.53	0.600	2.385	81.61	80.36	146.47	247.56	60.04
2	20.0	15.929	3.72	0.622	2.488	83.59	82.57	146.26	244.33	61.71
3	30.0	23.927	3.75	0.612	2.463	81.36	81.42	145.25	247.99	63.59
4	40.0	31.874	3.71	0.610	2.418	81.74	80.86	145.08	247.59	63.58
5	50.0	39.801	3.77	0.605	2.421	80.77	80.42	145.02	247.86	63.44
6	60.0	47.843	3.87	0.619	2.461	81.24	80.49	146.13	248.82	65.11
7	70.0	55.792	3.83	0.616	2.401	82.77	81.65	146.69	248.95	64.25
8	80.0	63.888	3.95	0.620	2.458	84.62	82.83	146.15	247.32	65.17
9	90.0	71.971	4.01	0.620	2.462	83.47	82.91	146.86	248.80	67.43
10	100.0	79.982	3.98	0.613	2.412	84.13	83.10	145.84	251.07	66.58
11	110.0	87.945	3.98	0.603	2.352	86.29	84.28	145.94	250.12	66.25
12	120.0	95.924	4.05	0.603	2.359	87.65	85.55	146.57	250.93	65.84

C011

METHOD 5 DATA SUMMARY

[illegible]ct: Mercury Test Report
[illegible] Site: Reid Gardner Station
Sampling Location: Stack
Site ID: 4:
Reported By: 2

Remarks:
Stack, Run #1

Run Number: 1
Date: 04/19/2000

Stack Gas Temperature Ts (½F): 146.02

Moisture Content Bws: 0.117

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 28.60

Absolute Gas Pressure Ps (in Hg): 28.62

Gas Velocity Pressure delta P avg (in H2O): 0.612

sqrt(delta p) avg.: 0.782

Gas Velocity Vs (ft/sec): 48.34

Gas Flow Rate Qs (ft3/hr): 44418888.00

[illegible]culate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 102.64

C011

PRELIMINARY CALCULATIONS

nt Site: Reid Gardner Station Date: 04/20/2000
ling Location: Stack Stack ID (in): 252.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.036
V2	Final meter reading	dcf	94.272
Vm	Volume dry gas, meter conditions	dcf	94.236
PBar	Barometric pressure	in Hg	28.48
DH	Average orifice pressure drop	in H2O	2.26
Tm	Average meter temperature	½F	94.939
Vmstd	Volume dry gas, standard conditions	dscf	85.975
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.115
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	28.62
DPs	Average stack gas velocity head	inH2O	0.561
Ts	Average stack temperature	½F	141.89
Ps	Stack pressure, absolute	in Hg	28.53
Vs	Average stack gas velocity	ft/sec	46.16
ID	Inside stack diameter	in	252.00
As	Stack area	in2	49875.93
Qs	Stack flowrate, dry standard conditions	dscfh	42682024.00
TT	Net time of run	min	120.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		102.33
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

C011

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
ling Location: Stack

Date: 04/20/2000
Stack ID (in): 252.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	10.0	7.540	3.27	0.529	2.183	91.30	90.58	140.78	247.00	56.84
2	20.0	15.428	3.54	0.566	2.330	93.74	92.26	141.33	249.29	59.94
3	30.0	23.428	3.66	0.580	2.382	93.84	92.32	142.02	249.74	61.59
4	40.0	31.283	3.61	0.566	2.298	94.68	92.64	141.68	249.82	63.02
5	50.0	39.227	3.69	0.572	2.316	96.87	94.15	141.64	250.14	62.48
6	60.0	47.228	3.75	0.580	2.316	97.24	94.40	142.17	248.92	60.93
7	70.0	55.087	3.70	0.561	2.258	97.88	95.15	142.44	249.68	59.42
8	80.0	62.889	3.70	0.548	2.215	98.51	95.56	142.07	250.06	57.92
9	90.0	70.822	3.79	0.564	2.258	99.92	96.61	141.67	249.83	55.55
10	100.0	78.677	3.78	0.557	2.226	100.14	97.29	141.93	249.87	55.28
11	110.0	86.474	3.81	0.549	2.181	97.12	95.38	142.46	249.45	55.09
12	120.0	94.272	3.91	0.558	2.187	91.37	89.58	142.44	249.25	54.66

C011

METHOD 5 DATA SUMMARY

ct: Mercury Test Report
Site: Reid Gardner Station
Sampling Location: Stack
Site ID: 4:
Reported By: 2

Remarks:
Stack, Run #2

Run Number: 1
Date: 04/20/2000

Stack Gas Temperature Ts (½F): 141.89

Moisture Content Bws: 0.115

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 28.62

Absolute Gas Pressure Ps (in Hg): 28.53

Gas Velocity Pressure delta P avg (in H2O): 0.561

sqrt(delta p) avg.: 0.749

Gas Velocity Vs (ft/sec): 46.16

Gas Flow Rate Qs (ft3/hr): 42682024.00

culate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 102.33

C011

PRELIMINARY CALCULATIONS

Plant Site: Reid Gardner Station
Sampling Location: Stack
Date: 04/25/2000
Stack ID (in): 252.00

Name	Description	Units	Value
V1	Initial meter reading	dcf	0.038
V2	Final meter reading	dcf	97.282
Vm	Volume dry gas, meter conditions	dcf	97.244
PBar	Barometric pressure	in Hg	25.45
DH	Average orifice pressure drop	in H2O	2.44
Tm	Average meter temperature	½F	81.534
Vmstd	Volume dry gas, standard conditions	dscf	81.339
Vwstd	Volume H2O vapor, standard conditions	scf	0.000
Vlc	Total H2O collected	ml	0.00
Bws	Water vapor in gas stream		0.113
Md	Dry Molecular weight, stack gas	g/g-mole	30.00
Ms	Molecular weight, wet basis	g/g-mole	28.64
DPs	Average stack gas velocity head	inH2O	0.636
Ts	Average stack temperature	½F	145.44
Ps	Stack pressure, absolute	in Hg	28.48
Vs	Average stack gas velocity	ft/sec	49.31
ID	Inside stack diameter	in	252.00
As	Stack area	in2	49875.93
Qs	Stack flowrate, dry standard conditions	dscfh	45349844.00
TT	Net time of run	min	120.0
DN	Probe tip diameter	in	0.2500
AN	Probe tip area	in2	0.0491
PERI	Percent isokinetic		91.12
MN	Total Particulate weight collected	mg	0.00
Cs	Particulate Concentration, dry standard	g/dscf	0.000000

C011

METHOD 5 FIELD DATA

Plant Site: Reid Gardner Station
Sampling Location: Stack

Date: 04/25/2000
Stack ID (in): 252.00

Pt	Time	Volume	System Vacuum	Delta P	Delta H	Ti	To	Ts	Tf	Timp
	min	ft3	inHg	inH2O	inH2O	½F	½F	½F	½F	½F
1	10.0	8.132	3.58	0.653	2.530	76.30	75.12	143.78	249.06	66.90
2	20.0	16.372	3.69	0.665	2.570	78.77	76.39	145.36	250.78	61.21
3	30.0	24.454	3.59	0.629	2.457	80.66	77.78	144.30	249.89	59.45
4	40.0	32.521	3.59	0.630	2.434	82.30	79.17	145.64	251.55	60.30
5	50.0	40.676	3.70	0.639	2.464	83.48	80.21	145.98	250.91	58.72
6	60.0	48.750	3.69	0.630	2.410	83.77	80.48	146.20	250.69	58.29
7	70.0	56.828	3.75	0.639	2.413	84.17	80.94	147.36	251.93	60.19
8	80.0	64.943	3.81	0.634	2.416	84.98	81.74	144.89	251.10	59.76
9	90.0	72.975	3.81	0.614	2.371	84.49	81.42	144.97	251.39	59.80
10	100.0	81.065	3.86	0.633	2.396	84.63	81.76	144.92	250.75	59.09
11	110.0	89.217	3.95	0.633	2.421	85.64	82.51	145.94	252.28	58.89
12	120.0	97.282	3.93	0.626	2.360	86.72	83.38	145.97	251.81	59.02

C011

METHOD 5 DATA SUMMARY

ect: Mercury Test Report
Site: Reid Gardner Station
Sampling Location: Stack
Site ID: 4:
Reported By: 2

Remarks:
Stack, Run #3

Run Number: 1
Date: 04/25/2000

Stack Gas Temperature Ts (½F): 145.44

Moisture Content Bws: 0.113

Gas Molecular Weight:
- Dry basis Md (lb/lb-mole): 30.00
- Wet basis Ms (lb/lb-mole): 28.64

Absolute Gas Pressure Ps (in Hg): 28.48

Gas Velocity Pressure delta P avg (in H2O): 0.636

sqrt(delta p) avg.: 0.797

Gas Velocity Vs (ft/sec): 49.31

Gas Flow Rate Qs (ft3/hr): 45349844.00

culate Concentration (g/dscf): 0.000000

Percent Isokinetic PERI: 91.12

Mercury Data Conversions

Plant Name: RG Page 1
General Average Report
Reporting Period: 4/19/00 to 4/19/00
Site Name: RG4 Time of Report 6/8/00 11:17
Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	STACK LOAD (MW)	STACK NOXPPM (PPM)	STACK NOx (#/mmBtu)	STACK SO2PPM (PPM)	STACK SO2 (#/mmBtu	STACK O2D (%)	STACK CO2 (%)	INLET A LOAD	INLET A NOXPPM	INLET A SO2PPM	INLET A O2D	INLET A CO2	INLET B LOAD (MW)	INLET B NOXPPM (PPM)	INLET B NOx (#/mmBtu)	INLET B SO2PPM (PPM)	INLET B SO2 (#/mmBtu)	INLET B O2D (%)	INLET B CO2 (%)
4/19/00	11:52								284.3	237<	311<	5.0<	14.2<							
	11:53								284.7	237	312.6	5	14.1							
	11:54								285.3	226.7	310.8	5.1	14.2							
	11:55								285.2	228.3	317.2	4.9	14.3							
	11:56													284.8	194.2<		286.5<		6.6<	12.6<
	11:57													284.6	232.2<		334.5<		3.9<	15.2<
	11:58													285	226.8	0.3204	354.7	0.6978	3.5	15.3
	11:59													285.3	224.5	0.3154	358.8	0.7018	3.4	15.4
	12:00													285.3	232.2	0.3280	354.4	0.6972	3.5	15.3
	12:01	285.1	176.8<		193.4<		6.2<	12.1<												
	12:02	284.3	170.3<		37.4<		8.1<	11.4<												
	12:03	284.4	168.5	0.3211	31.3	0.0831	8	11.5												
	12:04	285.1	166.5	0.3148	32.2	0.0848	7.9	11.6												
	12:05	285.3	167.3	0.3139	31.7	0.0828	7.8	11.6												
	12:06								285.3	211.8<	192.6<	7.8	13.7<							
	12:07								285.2	236.2<	313.4<	4.9<	14.3<							
	12:08								284.3	234.2	315.7	4.9	14.3							
	12:09								284.9	230.8	312.1	5	14.3							
	12:10								285.3	224.8	315.1	4.9	14.3							
	12:11													285.3	195.7<		294.9<		6.5<	12.7<
	12:12													285.2	233.1<		339.5<		3.8<	15.2<
	12:13													284.3	229.5	0.3242	354.3	0.6970	3.5	15.3
	12:14													284.5	233.2	0.3295	354.4	0.6972	3.5	15.3
	12:15													285.2	228.4	0.3208	355.9	0.6962	3.4	15.3
	12:16	285.2	175.2<		199.7<		5.9<	12.3<												
	12:17	285	173.1		35.9<		7.9<	11.6												
	12:18	284.5	173	0.3271	36.3	0.0956	7.9	11.6												
	12:19	284.5	169.9	0.3213	32.2	0.0848	7.9	11.5												
	12:20	285.2	173.5	0.3281	31.5	0.0829	7.9	11.6												
	12:21								285.3	218.3<	194.3<	7.9	13.7<							
	12:22								285.3	236.1<	312.9<	4.9<	14.3<							
	12:23								285	240	313	5	14.2							
	12:24								285.2	241.6	309.4	5.1	14.2							
	12:25								285.3	243.8	312.1	5	14.3							
	12:26													285.3	199.6<		296.0<		6.4<	12.8<
	12:27													285.1	229.0<		343.0<		3.7<	15.1<
	12:28													284.3	226.3	0.3216	353.9	0.7002	3.6	15.2
	12:29													284.7	229.2	0.3220	357.4	0.6991	3.4	15.3
	12:30													285.3	227.3	0.3193	359.2	0.7026	3.4	15.3
	12:31	285.3	176.3<		194.3<		5.9<	12.3<												
	12:32	285.3	174.2<		34.8<		7.9<	11.5<												
	12:33	284.7	176.2	0.3332	36.6	0.0964	7.9	11.6												
	12:34	284.3	172.8	0.3293	31.4	0.0833	8	11.5												
	12:35	284.8	174.6	0.3302	30.9	0.0814	7.9	11.6												
	12:36								285.2	221.7<	194.8<	7.8	13.8<							
	12:37								285.3	244.3<	314.5<	4.9<	14.3<							
	12:38								285.1	247.5	313.4	4.9	14.3							
	12:39								284.8	242.9	313.8	4.9	14.3							
	12:40								285.2	240.5	314.7	4.8	14.4							
	12:41													285.2	198.1<		297.0<		6.4<	12.8<
	12:42													285.3	231.7<		346.6<		3.5<	15.3<
	12:43													285.1	230.5	0.3256	356.4	0.7011	3.5	15.3
	12:44													284.5	230	0.3287	351.1	0.6987	3.7	15.1
	12:45													284.8	230	0.3268	353.2	0.6989	3.6	15.2
	12:46	285.3	182.3<		193.1<		6.1<	12.2<												
	12:47	285.3	172.8<		34.2<		7.8<	11.7<												
	12:48	285.3	175.2	0.3288	37.7	0.0985	7.8	11.6												
	12:49	284.3	176.9	0.3345	32.1	0.0845	7.9	11.6												
	12:50	284.7	178.4	0.3348	31.9	0.0834	7.8	11.6												
	12:51								285.1	219.4<	192.4<	7.9	13.7<							
	12:52								285.2	233.5<	316.2<	4.8<	14.4<							
	12:53								285.3	229.5	313.7	5	14.1							
	12:54								285	230.9	311.7	5	14.2							
	12:55								284.6	233.9	314.5	4.8	14.4							
	12:56													285.1	194.4<		290.2<		6.4<	12.8<
	12:57													285.3	232.0<		346.8<		3.5<	15.3<
	12:58													285.2	238.2	0.3365	354.7	0.6978	3.5	15.2
	12:59													284.6	239.9	0.3429	348.4	0.6934	3.7	15.2
	13:00													284.5	238.2	0.3385	349.5	0.6915	3.6	15.3
	13:01	284.9	179.5<		209.0<		6.0<	12.3<												
	13:02	285.3	170.4<		34.2<		7.8<	11.6<												
	13:03	285.3	172.3	0.3209	36.5	0.0947	7.7	11.7												
	13:04	285.3	174.6	0.3302	32.2	0.0848	7.9	11.6												
	13:05	284.9	178.8	0.3381	31.8	0.0837	7.9	11.6												
	13:06								284.3	226.1<	187.6<	7.9	13.6<							
	13:07								284.8	235.6<	310.3<	4.9<	14.3<							
	13:08								285.3	236.9	316.5	4.8	14.4							
	13:09								285.3	239.9	315.4	4.8	14.4							
	13:10								285.1	233.1	314.5	5	14.2							
	13:11													284.5	198.6<		288.0<		6.6<	12.6<
	13:12													284.8	229.2<		337.2<		3.8<	15.2<
	13:13													285.1	227.4	0.3194	355.1	0.6946	3.4	15.3
	13:14													285.3	237.2	0.3332	356.3	0.6969	3.4	15.3
	13:15													285	238.4	0.3368	353.8	0.6960	3.5	15.3
	13:16	284.3	182.5<		188.8<		6.1<	12.2<												
	13:17	284.9	176.1<		36.6<		7.9<	11.6<												
	13:18	285.3	174.5	0.3274	35.1	0.0917	7.8	11.7												
	13:19	285.3	176.5	0.3312	33	0.0862	7.8	11.6												
	13:20	285	178	0.3340	33.1	0.0865	7.8	11.7												
	13:21								284.4	235.0<	177.7<	7.8<	13.6<							
	13:22								284.3	253.0<	315.3<	5.1<	14.2<							
	13:23								284.7	256.8	322.1	4.8	14.4							
	13:24								285.3	252.7	321	4.9	14.4							
	13:25								285.2	267.4	321.4	4.9	14.3							
	13:26													285.1	217.2<		304.9<		6.4<	12.9<
	13:27													284.5	243.0<		361.4<		3.9<	15.1<
	13:28													284.8	244.1	0.3468	369.7	0.7315	3.6	15.3
	13:29													285.3	236.4	0.3321	368.7	0.7212	3.4	15.4
	13:30													285.1	231.9	0.3239	368.8	0.7173	3.3	15.4

13:31	284.7	179.8<		213.1<		6.1<	12.2<												
13:32	284.8	177.2<		36.0<		8.0<	11.5<												
13:33	285.2	181.3	0.3428	33.2	0.0874	7.9	11.6												
13:34	285.3	176.3	0.3308	32.8	0.0857	7.8	11.7												
13:35	285.3	174.5	0.3250	32.9	0.0853	7.7	11.7												
13:36								285.2	226.7<	176.5<	7.8	13.7<							
13:37								284.6	244.7<	313.7<	5.0<	14.2<							
13:38								284.6	246.5	311.7	5.1	14.2							
13:39								285.2	239.9	311	5	14.3							
13:40								285.3	238.3	317	4.8	14.4							
13:41													285.2	198.6<		297.5<		6.5<	12.7<
13:42													284.3	233.4<		343.5<		3.8<	15.3<
13:43													284.3	238.2	0.3385	354.3	0.7010	3.6	15.3
13:44													284.8	230.1	0.3308	350.1	0.7008	3.8	15
13:45													285.3	226.6	0.3201	354.2	0.6968	3.5	15.3
13:46	285.3	177.2<		194.8<		5.9<	12.4<												
13:47	284.5	176.7<		37.7<		7.8<	11.7<												
13:48	284.4	176.6	0.3365	34.7	0.0921	8	11.5												
13:49	285.2	175	0.3335	37.3	0.0990	8	11.5												
13:50	285.3	173.4	0.3229	34.8	0.0902	7.7	11.7												
13:51								285.3	222.0<	193.5<	7.7<	13.7<							
13:52								284.9	244.7<	309.6<	5.2<	14.1<							
13:53								284.3	243.9	310.6	5.1	14.2							
13:54								284.3	242.2	314.3	5	14.3							
13:55								284.8	238.4	316	4.9	14.3							
13:56													285.3	193.1<		295.9<		6.6<	12.5<
13:57													285.3	228.0<		334.5<		4.1<	15.0<
13:58													284.4	230.8	0.3279	352.4	0.6973	3.6	15.2
13:59													284.5	233.9	0.3343	351.9	0.7003	3.7	15.2
14:00													285.1	232.3	0.3301	352.7	0.6979	3.6	15.2
14:01	285.3	176.5<		197.0<		6.0<	12.3<												
	285.0	**174.3**	**0.3288**	**33.5**	**0.0879**	**7.9**	**11.6**						**284.9**	**232.3**	**0.3287**	**355.7**	**0.7008**	**3.5**	**15.3**

Plant General Reporting Site Data

Name: RG Average Report
Page: 1
Period: 4/20/00 to 4/20/00
Name: RG4 Time of Report: 6/8/00 11:17
Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Stack LOAD (MW)	Stack NOXPPM (PPM)	Stack NOx (#/mmBtu)	Stack SO2PPM (PPM)	Stack SO2 (#/mmBtu)	Stack O2D (%)	Stack CO2 (%)	Inlet A LOAD (MW)	Inlet A NOXPPM (PPM)	Inlet A SO2PPM (PPM)	Inlet A O2D (%)	Inlet A CO2 (%)	Inlet B LOAD (MW)	Inlet B NOXPPM (PPM)	Inlet B NOx (#/mmBtu)	Inlet B SO2PPM (PPM)	Inlet B SO2 (#/mmBtu)	Inlet B O2D (%)	Inlet B CO2 (%)
4/20/00	10:41													285.3	186.2<		295.1<		6.6<	12.7<
	10:42													285.3	215.6<		336.6<		4.1<	15.2<
	10:43													285.3	215.9	0.3140	351.5	0.7120	4	15.1
	10:44													284.6	217.5	0.3165	352.8	0.7146	4	15.2
	10:45													284.3	215.8	0.3139	353.6	0.7162	4	15.1
	10:46	284.7	171.4<		195.9<		6.3<	12.4<												
	10:47	285.3	168.1		36.6<		7.9<	11.8												
	10:48	285.3	167.3	0.3139	33.6	0.0878	7.8	11.9												
	10:49	285.1	166.5	0.3124	33.4	0.0873	7.8	11.9												
	10:50	284.5	170.6	0.3226	32.5	0.0856	7.9	11.8												
	10:51								284.7	216.4<	178.0<	7.9<	13.7<							
	10:52								285.3	230.1<	324.1<	4.9<	14.7<							
	10:53								285.3	228.7	336.4	4.7	14.7							
	10:54								285.1	233.7	334.3	4.8	14.7							
	10:55								284.7	237.8	322.5	5	14.5							
	10:56													284.5	184.1<		294.7<		6.8<	12.7<
	10:57													285.1	202.3<		345.3<		3.9<	15.3<
	10:58													285.3	205.2	0.2916	363.7	0.7196	3.6	15.3
	10:59													285.2	212.7	0.3058	357.4	0.7154	3.8	15.2
	11:00													284.7	213.3	0.3121	348.9	0.7109	4.1	15.1
	11:01	284.3	170.8<		195.7<		6.3<	12.4<												
	11:02	285.1	167.5		36.7<		7.8<	11.9												
	11:03	285.3	169.8	0.3186	33.9	0.0886	7.8	11.9												
	11:04	285.3	168.9	0.3169	33.9	0.0886	7.8	11.8												
	11:05	285.2	172.3	0.3233	33.2	0.0868	7.8	11.9												
	11:06								284.3	226.9<	176.9<	7.8<	13.9<							
	11:07								284.3	244.4<	315.8<	5.1<	14.5<							
	11:08								285.1	239.1	320.3	4.9	14.6							
	11:09								285.3	242.2	321.7	4.9	14.6							
	11:10								285.2	239.7	321.3	4.8	14.6							
	11:11													284.5	187.4<		292.2<		6.6<	12.8<
	11:12													284.3	209.9<		336.4<		4.2<	15.0<
	11:13													285.3	210.7	0.3029	353.5	0.7076	3.8	15.3
	11:14													285.3	205.4	0.2919	358.6	0.7095	3.6	15.3
	11:15													284.8	205	0.2930	355.3	0.7071	3.7	15.3
	11:16	284.4	168.1<		195.1<		6.1<	12.5<												
	11:17	284.3	167		36.9<		7.9<	11.8												
	11:18	284.9	169.1	0.3149	34	0.0882	7.7	11.9												
	11:19	285.3	168	0.3129	34	0.0882	7.7	11.9												
	11:20	284.7	165.6	0.3084	33.5	0.0869	7.7	12												
	11:21								284.5	219.2<	180.2<	7.6<	14.1<							
	11:22								284.3	235.9<	321.0<	4.8<	14.7<							
	11:23								285.1	235.8	323.8	4.7	14.8							
	11:24								285.3	234.9	325.1	4.6	14.8							
	11:25								285.3	237.4	325	4.6	14.8							
	11:26													284.5	184.7<		296.4<		6.6<	12.8<
	11:27													284.3	208.6<		334.7<		4.1<	15.2<
	11:28													284.6	207.9	0.3006	350.4	0.7056	3.9	15.2
	11:29													285.2	207.6	0.3020	348.4	0.7057	4	15
	11:30													285.3	212	0.3066	346.8	0.6983	3.9	15.2
	11:31	284.9	171.9<		198.9<		6.0<	12.6<												
	11:32	284.3	170.2		37.6<		7.7<	11.9												
	11:33	284.5	170.7	0.3203	34.6	0.0904	7.8	11.9												
	11:34	285.2	165.5	0.3106	33.3	0.0870	7.8	11.9												
	11:35	285.3	162.4	0.3002	33.6	0.0865	7.6	12												
	11:36								285.3	214.5<	179.6<	7.5<	14.1<							
	11:37								284.9	230.7<	320.1<	4.8<	14.6<							
	11:38								284.3	229.5	316.7	5	14.5							
	11:39								284.6	227.2	320.3	4.8	14.7							
	11:40								285.3	224	321.1	4.6	14.9							
	11:41													285.3	181.1<		294.7<		6.7<	12.6<
	11:42													285.1	212.6<		332.4<		4.1<	15.2<
	11:43													284.3	207.8	0.2987	348.8	0.6982	3.8	15.3
	11:44													284.6	208.8	0.2984	350	0.6966	3.7	15.3
	11:45													285.3	208.3	0.2960	353.2	0.6989	3.6	15.3
	11:46	285.3	167.7<		211.2<		6.0<	12.6<												
	11:47	285.3	166.2		35.8<		7.7<	12												
	11:48	284.5	168	0.3105	33	0.0849	7.6	12												
	11:49	284.3	169.4	0.3155	37.1	0.0962	7.7	11.9												
	11:50	284.8	168.8	0.3144	31.5	0.0817	7.7	11.9												
	11:51								285.3	212.5<	195.0<	7.7<	14.0<							
	11:52								285.1	230.4<	319.6<	4.7<	14.7<							
	11:53								284.7	234.6	319.7	4.8	14.6							
	11:54								284.4	233.6	319.6	4.8	14.7							
	11:55								284.8	231.8	316.3	4.9	14.5							
	11:56													285.1	181.0<		292.3<		6.8<	12.6<
	11:57													284.6	206.7<		335.7<		3.9<	15.2<
	11:58													284.5	210.7	0.3011	350.1	0.6968	3.7	15.2
	11:59													284.3	211.1	0.3035	348.9	0.6984	3.8	15.2
	12:00													285.1	210.8	0.3013	350.8	0.6982	3.7	15.3
	12:01	285.3	168.4<		191.5<		6.0<	12.5<												
	12:02	285.3	166.9		34.5<		7.6<	11.9												
	12:03	284.9	168.8	0.3120	36.5	0.0939	7.6	11.9												
	12:04	284.3	171.5	0.3194	30.7	0.0796	7.7	11.9												
	12:05	284.3	168.1	0.3107	30.4	0.0782	7.6	12												
	12:06								285	219.5<	193.9<	7.6<	14.0<							
	12:07								285.3	233.7<	319.4<	4.7<	14.7<							
	12:08								285.3	234.4	320.7	4.7	14.6							
	12:09								284.8	239.3	319.3	4.8	14.6							
	12:10								284.4	233.8	317.2	4.8	14.6							
	12:11													285	181.5<		295.6<		6.4<	12.8<
	12:12													285.3	203.8<		334.4<		4.0<	15.1<
	12:13													285.2	208.1	0.2957	349.9	0.6923	3.6	15.3
	12:14													284.4	213.6	0.3035	352.3	0.6971	3.6	15.3

12:01	283.5	194.1<		176.0<		6.6<	12.3<
12:02	283.5	186.0		35.3<		8.1<	11.6
12:03	283.5	181.6	0.3461	29.2	0.0775	8.0	11.7
12:04	283.5	208.3	0.3939	29.3	0.0772	7.9	11.7
12:05	283.4	203.1	0.3870	28.7	0.0762	8.0	11.7
12:06	283.5	239.7<		151.4<		8.0	13.5<
12:07	283.7	251.7<		273.1<		5.5<	14.0<
12:08	283.6	245.9<		280.6<		5.1<	14.3<
12:09	283.5	243.5<		278.8<		5.2<	14.2<
12:10	283.5	240.2<		277.8<		5.3<	14.1<
12:11	283.5	186.6<		252.4<		7.2<	12.3<
12:12	283.5	219.6<		301.0<		4.6<	14.8<
12:13	283.9	218.2	0.2566	306.3	0.6394	4.5	14.8
12:14	283.5	219.7	0.2584	298.6	0.6233	4.5	14.8
12:15	283.5	221.9	0.2610	299.3	0.6286	4.6	14.7
12:16	283.5	191.4<		176.3<		6.5<	12.4<
12:17	283.7	185.4		35.8<		7.9<	11.8
12:18	283.6	184.5	0.3489	30.3	0.0798	7.9	11.8
12:19	283.5	194.8	0.3684	29.7	0.0782	7.9	11.8
12:20	283.6	175.0	0.3335	29.3	0.0778	8.0	11.7
12:21	283.6	252.7<		169.3<		7.9	13.6<
12:22	283.5	272.0<		272.3<		5.3<	14.1<
12:23	283.5	257.1<		274.7<		5.2<	14.2<
12:24	284.1	242.5<		275.0<		5.2<	14.2<
12:25	283.7	239.6<		275.0<		5.2<	14.2<
12:26	283.5	188.9<		254.5<		7.0<	12.5<
12:27	283.8	210.5<		290.0<		4.7<	14.6<
12:28	283.7	207.5	0.2441	294.8	0.6230	4.7	14.6
12:29	283.5	211.8	0.2491	302.7	0.6280	4.4	14.7
12:30	283.5	205.9	0.2422	297.4	0.6246	4.6	14.6
12:31	283.5	172.6<		175.1<		6.5<	12.3<
12:32	283.5	174.2		37.9<		8.0<	11.7
12:33	283.6	176.5	0.3337	31.3	0.0824	7.9	11.8
12:34	283.5	172.9	0.3244	30.7	0.0802	7.8	11.8
12:35	283.5	173.3	0.3277	31.4	0.0827	7.9	11.7
Average	**283.6**	**190.7**	**0.3648**	**29.7**	**0.0785**	**7.9**	**11.7**
	283.6	**228.2**	**0.2707**	**301.1**	**0.6286**	**4.5**	**14.7**

Plant Name: RG Page: 1
General Average Report
Reporting Period: 4/25/00 to 4/25/00
Site Name: RG4 Time of Report: 6/8/00 11:17
Data Averaging Type: 1m Rolling Average Interval: 1

Date	Time	Stack LOAD (MW)	Stack NOXPPM (PPM)	Stack NOx (#/mmBtu)	Stack SO2PPM (PPM)	Stack SO2 (#/mmBtu)	Stack O2D (%)	Stack CO2 (%)	Inlet A LOAD (MW)	Inlet A NOXPPM (PPM)	Inlet A SO2PPM (PPM)	Inlet A O2D (%)	Inlet A CO2 (%)	Inlet B LOAD (MW)	Inlet B NOXPPM (PPM)	Inlet B NOx (#/mmBtu)	Inlet B SO2PPM (PPM)	Inlet B SO2 (#/mmBtu)	Inlet B O2D (%)	Inlet B CO2 (%)
4/25/00	10:26													283.4	192.1<		254.7<		7.0<	12.4<
	10:27													284.0	218.0<		293.9<		4.3<	15.0<
	10:28													283.9	218.6	0.3199	308.8	0.6292	4.1	14.9
	10:29													283.5	218.5	0.2570	298.9	0.6278	4.6	14.6
	10:30													282.9	211.8	0.2491	301.4	0.6291	4.5	14.6
	10:31	282.9	182.9<		173.6<		6.7<	12.2<												
	10:32	284.0	183.0		37.9<		8.0<	11.7												
	10:33	284.4	189.0	0.3547	32.8	0.0857	7.8	11.8												
	10:34	284.3	207.7	0.3868	32.2	0.0835	7.7	11.9												
	10:35	284.1	210.9	0.3988	31.1	0.0819	7.9	11.7												
	10:36								283.4	265.5<	166.4<		8.0 13.5<							
	10:37								283.4	269.1<	267.3<	5.7<	13.7<							
	10:38								283.4	277.4<	265.4<	5.7<	13.9<							
	10:39								283.4	260.1<	271.5<	5.4<	14.0<							
	10:40								283.4	260.6<	270.2<	5.5<	14.0<							
	10:41													283.8	197.1<		247.3<		7.2<	12.3<
	10:42													283.7	230.8<		286.0<		4.7<	14.8<
	10:43													283.4	265.3	0.3120	295.5	0.6168	4.5	14.7
	10:44													283.4	248.1	0.2918	295.3	0.6202	4.6	14.7
	10:45													283.5	243.0	0.2858	297.1	0.6202	4.5	14.8
	10:46	283.9	193.4<		175.3<		6.5<	12.3<												
	10:47	283.6	188.1		36.4<		7.9<	11.8												
	10:48	283.4	193.1	0.3680	29.8	0.0791	8.0	11.7												
	10:49	283.5	194.9	0.3743	28.6	0.0765	8.1	11.7												
	10:50	283.4	193.8	0.3693	28.3	0.0751	8.0	11.7												
	10:51								283.4	247.8<	151.3<		8.0 13.7<							
	10:52								283.4	263.3<	272.4<	5.4<	14.0<							
	10:53								283.4	251.6<	270.6<	5.4<	14.1<							
	10:54								283.8	245.6<	276.6<	5.2<	14.1<							
	10:55								283.5	246.7<	271.7<	5.4<	14.1<							
	10:56													283.4	195.0<		252.2<		7.0<	12.4<
	10:57													283.5	219.0<		290.1<		4.5<	14.8<
	10:58													283.7	219.2	0.2578	302.3	0.6234	4.3	14.9
	10:59													284.0	212.9	0.2504	337.0	0.6867	4.1	15.0
	11:00													283.9	212.7	0.2502	321.2	0.6624	4.3	14.8
	11:01	283.3	179.9<		177.3<		6.5<	12.2<												
	11:02	283.4	180.5		35.2<		8.2<	11.6												
	11:03	283.4	177.4	0.3380	29.9	0.0793	8.0	11.7												
	11:04	283.7	181.2	0.3480	29.5	0.0789	8.1	11.7												
	11:05	283.7	185.5	0.3481	29.4	0.0768	7.8	11.8												
	11:06								283.7	229.8<	169.2<		7.8 13.5<							
	11:07								283.7	248.8<	273.1<	5.4<	14.0<							
	11:08								283.7	245.0<	273.7<	5.3<	14.1<							
	11:09								283.6	241.5<	272.8<	5.4<	14.0<							
	11:10								283.4	241.2<	270.9<	5.4<	14.1<							
	11:11													283.4	186.7<		252.5<		7.1<	12.3<
	11:12													283.4	215.6<		290.8<		4.7<	14.7<
	11:13													283.5	217.0	0.2552	303.1	0.6327	4.5	14.8
	11:14													284.0	220.2	0.2590	301.1	0.6285	4.5	14.7
	11:15													283.4	217.7	0.2561	300.4	0.6233	4.4	14.7
	11:16	283.9	180.4<		174.7<		6.6<	12.3<												
	11:17	284.0	182.4		36.4<		8.0<	11.8												
	11:18	283.6	182.2	0.3445	29.6	0.0779	7.9	11.8												
	11:19	283.4	192.5	0.3668	28.8	0.0764	8.0	11.7												
	11:20	283.6	186.6	0.3584	28.1	0.0752	8.1	11.6												
	11:21								283.7	222.0<	152.0<		8.0 13.8<							
	11:22								283.6	241.5<	275.1<	5.2<	14.2<							
	11:23								283.9	243.0<	272.4<	5.3<	14.2<							
	11:24								283.6	242.2<	275.0<	5.1<	14.2<							
	11:25								283.7	256.9<	273.4<	5.2<	14.2<							
	11:26													283.5	197.7<		249.4<		7.1<	12.4<
	11:27													283.6	236.6<		284.2<		4.7<	14.7<
	11:28													283.4	225.3	0.2650	299.4	0.6327	4.7	14.6
	11:29													283.5	244.9	0.2880	295.5	0.6244	4.7	14.6
	11:30													283.8	237.1	0.2789	301.9	0.6341	4.6	14.7
	11:31	283.6	185.0<		174.2<		6.5<	12.3<												
	11:32	283.5	192.5		36.4<		7.9<	11.8												
	11:33	283.5	191.1	0.3642	29.4	0.0780	8.0	11.7												
	11:34	283.5	203.5	0.3878	29.0	0.0770	8.0	11.8												
	11:35	283.5	197.4	0.3762	28.6	0.0759	8.0	11.8												
	11:36								283.5	249.7<	148.1<		8.0 13.7<							
	11:37								283.4	268.6<	272.5<	5.2<	14.2<							
	11:38								283.5	265.3<	272.8<	5.2<	14.2<							
	11:39								284.4	271.3<	272.1<	5.2<	14.2<							
	11:40								283.7	256.6<	273.8<	5.2<	14.3<							
	11:41													283.4	206.2<		251.8<		7.0<	12.3<
	11:42													283.5	242.6<		276.4<		5.0<	14.6<
	11:43													283.8	237.6	0.2795	290.7	0.6068	4.5	14.8
	11:44													283.5	237.6	0.2795	296.7	0.6156	4.4	14.8
	11:45													283.4	242.5	0.2852	295.7	0.6172	4.5	14.8
	11:46	283.4	202.0<		173.6<		6.5<	12.3<												
	11:47	283.4	200.8		35.3<		8.1<	11.6												
	11:48	283.5	202.2	0.3823	29.1	0.0766	7.9	11.8												
	11:49	283.5	204.2	0.3861	29.2	0.0769	7.9	11.8												
	11:50	283.8	230.1	0.4351	28.9	0.0761	7.9	11.8												
	11:51								284.2	269.5<	150.0<		8.0 13.7<							
	11:52								284.4	268.7<	273.1<	5.2<	14.2<							
	11:53								283.6	287.3<	272.6<	5.3<	14.1<							
	11:54								283.5	275.6<	267.0<	5.6<	13.9<							
	11:55								283.5	280.5<	264.5<	5.6<	13.9<							
	11:56													283.4	214.1<		243.6<		7.2<	12.3<
	11:57													283.5	250.7<		286.1<		4.7<	14.7<
	11:58													283.4	240.8	0.2832	291.4	0.6158	4.7	14.6
	11:59													283.7	256.8	0.3020	304.0	0.6385	4.6	14.6
	12:00													283.5	248.0	0.2917	293.9	0.6211	4.7	14.7

12:15																			284.3	214.4	0.3064	349.6	0.6958	3.7	15.3
12:16	285.2	171.1<		205.6<		6.0<		12.5<																
12:17	285.3	170.9		34.4<		7.7<		11.9																
12:18	285.3	169	0.3100	34.8	0.0889	7.5		12																
12:19	284.6	170.1	0.3120	30.9	0.0789	7.5		12																
12:20	284.3	171.2	0.3164	30.8	0.0793	7.6		11.9																
12:21									284.5	220.2<	193.4<	7.8<	14.0<											
12:22									285.3	231.5<	318.9<	4.7<	14.7<											
12:23									285.3	228.9	324.3	4.6	14.8											
12:24									284.8	235.1	322.7	4.6	14.7											
12:25									284.3	240	317.3	4.9	14.5											
12:26																			284.3	184.7<		288.4<	6.5<	12.8<
12:27																			285.2	208.8<		340.9<	3.8<	15.2<
12:28																			285.3	208.1	0.2957	352.4	0.6973	3.6	15.2
12:29																			284.8	212.2	0.3068	347.1	0.6989	3.9	15.1
12:30																			284.3	215.3	0.3077	347.2	0.6910	3.7	15.3
12:31	284.5	175.0<		192.6<		6.0<		12.6<																
12:32	285.2	171.9		33.5<		7.6<		12																
12:33	285.3	167.6	0.3075	36.5	0.0932	7.5		12																
12:34	285.2	168.5	0.3091	30.8	0.0787	7.5		12																
12:35	284.5	171.1	0.3139	31.2	0.0797	7.5		12																
12:36									284.3	222.6<	194.3<	7.5<	14.0<											
12:37									284.8	236.1<	317.9<	4.7<	14.7<											
12:38									285.2	230.9	322.4	4.6	14.8											
12:39									285.3	231	324	4.5	14.8											
12:40									284.6	232.2	323	4.6	14.7											
12:41																			284.3	185.6<		294.7<	6.4<	12.8<
12:42																			284.4	213.8<		332.3<	4.0<	15.2<
12:43																			285	211.6	0.3024	348.4	0.6934	3.7	15.2
12:44																			285.3	210	0.2984	350.6	0.6937	3.6	15.3
12:45																			285.3	211.1	0.3000	351.1	0.6947	3.6	15.3
12:46	284.6	170.9<		191.5<		5.9<		12.6<																
12:47	284.3	166		37.7<		7.7<		11.9																
12:48	284.7	171.3	0.3166	31.4	0.0808	7.6		11.9																
12:49	285.3	166.1	0.3047	31	0.0792	7.5		12																
12:50	285.3	165.6	0.3061	30.3	0.0780	7.6		11.9																
Average	**284.88**	**168.51**	**0.3136**	**32.98**	**0.0853**	**7.66**		**11.92**											**284.85**	**210.78**	**0.3025**	**351.53**	**0.7024**	**3.77**	**15.23**

Particulate

	ug/joule	ug/Btu	lb/Btu	% of Total
Inlet Run 1	6.35723E-09	6.039E-12	1.329E-20	95.8%
Inlet Run 2	1.32031E-08	1.254E-11	2.759E-20	97.3%
Inlet Run 3	7.89733E-11	7.502E-14	1.651E-22	28.1%
Stack Run 1	9.93223E-11	9.436E-14	2.076E-22	23.9%
Stack Run 2	9.86545E-11	9.372E-14	2.062E-22	20.0%
Stack Run 3	9.99354E-11	9.494E-14	2.089E-22	22.7%

Oxidized

	ug/joule	ug/Btu		
Inlet Run 1	6.3458E-11	6.029E-14	1.326E-22	0.96%
Inlet Run 2	7.07818E-11	6.724E-14	1.479E-22	0.52%
Inlet Run 3	6.72113E-11	6.385E-14	1.405E-22	23.95%
Stack Run 1	8.45296E-11	8.030E-14	1.767E-22	20.30%
Stack Run 2	8.32527E-11	7.909E-14	1.740E-22	16.85%
Stack Run 3	1.10567E-10	1.050E-13	2.311E-22	25.12%

Elemental

	ug/joule	ug/Btu		
Inlet Run 1	2.15757E-10	2.050E-13	4.509E-22	3.25%
Inlet Run 2	2.99214E-10	2.843E-13	6.254E-22	2.20%
Inlet Run 3	1.34423E-10	1.277E-13	2.809E-22	47.90%
Stack Run 1	2.32456E-10	2.208E-13	4.858E-22	55.84%
Stack Run 2	3.12198E-10	2.966E-13	6.525E-22	63.18%
Stack Run 3	2.29639E-10	2.182E-13	4.799E-22	52.17%

Total

	ug/joule	ug/Btu	
Inlet Run 1	6.63644E-09	6.305E-12	1.387E-20
Inlet Run 2	1.35731E-08	1.289E-11	2.837E-20
Inlet Run 3	2.80607E-10	2.666E-13	5.865E-22
Stack Run 1	4.16308E-10	3.955E-13	8.701E-22
Stack Run 2	4.94105E-10	4.694E-13	1.033E-21
Stack Run 3	4.40141E-10	4.181E-13	9.199E-22

Particle Bound Hg

	Filter* (ug)	Probe Wash (ug)	Filter blank (ug)	Hg (ug) (particle bound)	Vmstd dscf	Vmstd liter conv.	Vmstd Liters	Concentration ug/l
R1Inlet	20	0.036	0.02	20.04	64.322	28.31685	1821.396	0.011000
R2Inlet	41	0.037	0.02	41.04	70.163		1986.795	0.020655
R3Inlet	0.2	0.035	0.02	0.24	70.597		1999.084	0.000118
R1Stack	0.2	0.035	0.02	0.24	89.488		2534.018	0.000093
R2Stack	0.2	0.037	0.02	0.24	85.975		2434.541	0.000097
R3Stack	0.2	0.035	0.02	0.24	89.623		2537.841	0.000093

Oxidized Hg

	Impingers 1,2,3 ug/l	Blank (KCl Solution) ug/l
R1Inlet	0.2	0.29
R2Inlet	0.22	
R3Inlet	0.2	
R1Stack	0.2	
R2Stack	0.2	
R3Stack	0.26	

Elemental Hg

	Impinger* 4 ug/l	Blank (HNO_3-H_2O_2) ug/l	Impingers* 5,6,7 ug/l	Blank (H_2SO_4-$KMnO_4$) ug/l
R1Inlet	0.2	0.2	0.48	0.21
R2Inlet	0.2		0.73	
R3Inlet	0.2		0.2	
R1Stack	0.2		0.35	
R2Stack	0.2		0.55	
R3Stack	0.2		0.34	

* = When analytical values were less than the detection limit the detection limit was reported.

Total Inlet Hg (ug/liter)

R1Inlet	**20.92**
R2Inlet	**42.19**
R3Inlet	**0.84**
R1Stack	**0.99**
R2Stack	**1.19**
R3Stack	**1.04**

APPENDIX-B

RAW FIELD DATA
AND
CALIBRATION DATA SHEETS

Leak Check Data
Moisture Data
Run Time Data Sheets

Leak Check Data

Leak Check Data

Plant	RG5				
Location	RG4				
Operator	JR/clt				
Date	~~4-17-00~~	4-18-00	4-20		4-25
Run #	~~3~~	1	2		3
Barometric Pressure	28.16	28.15	27.50		28.04
Probe Length	15'				
Ambient Temp	~~65°F~~	~~70°F~~	65°F		75°F

Test #	Leak Rate (cfm)	System Vacuum (inches Hg)	Initial Volume (cubic ft)	Final Volume (cubic ft)
1	~~0.01250~~	~~16.3"~~	~~0.114~~	~~0.125~~
2	0.01250	15.4"	0.754	0.762 ✓
3	0.01289	7.8"	95.960	95.999 ✓
4	0.01250	15.8"	0.121	0.129 ✓
5	0.01458	7.8"	94.310	94.389 ✓
6	0.01250	15.3"	0.122	0.124 ✓
7	0.01256	7.7"	97.319	97.352 ✓
8				

Notes: 4-18 #1 PRE Run Run Cancelled - Probe Problem

4-19 ~~#2~~ PRE Run #1 OK Pitot check OK ✓

4-19 ~~#3~~ POST Run #1 OK ✓ Pitot Check OK ✓

4-20 ~~#4~~ PRE Run #2 ✓ Pitot OK ✓

4-20 #5 POST Run #2 ✓ Pitot OK ✓

4-25 ~~#6 PRE Run #3 ✓~~ ~~Pitot OK~~

#7 POST Run #3 Pitot OK ✓

Leak Check Data

Plant	RG-4 Inlet B
Location	RG
Operator	CH
Date	4/19/00
Run #	1
Barometric Pressure	28.55
Probe Length	9'
Ambient Temp	72°F

Test #	Leak Rate (cfm)	System Vacuum (inches Hg)	Initial Volume (cubic ft)	Final Volume (cubic ft)
1	.01303	16.5	0.119	0.130
2	.01303	6.7	73.455	73.479
3				
4				
5				
6				
7				
8				

Notes: Pre Run #1 Pitot Leak check - Pass
Post Run #1 Pitot Leak check - pass

Leak Check Data

Plant	Reid Gardner
Location	#4 Inlet B
Operator	CH
Date	4/20/00
Run #	2
Barometric Pressure	27.90
Probe Length	9'
Ambient Temp	58°F

Test #	Leak Rate (cfm)	System Vacuum (inches Hg)	Initial Volume (cubic ft)	Final Volume (cubic ft)
1	.01303	16.3	0.122	0.139
2	.01303	6.5	80.087	80.113
3				
4				
5				
6				
7				
8				

Notes: Pre-Run #2 pitot check - Pass
Post-Run #2 Pitot check - Pass

Leak Check Data

Plant	RGS
Location	RG4
Operator	CH / JR
Date	4-25-00
Run #	3
Barometric Pressure	
Probe Length	
Ambient Temp	

Test #	Leak Rate (cfm)	System Vacuum (inches Hg)	Initial Volume (cubic ft)	Final Volume (cubic ft)
1	0.01303	16.3	0.114	0.134
2	0.01303	7.3	78.194	78.217
3				
4				
5				
6				
7				
8				

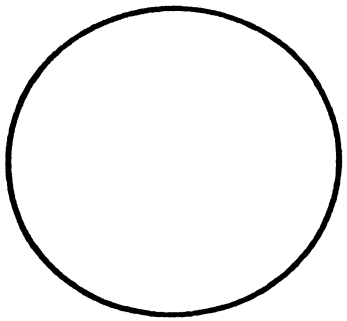
Notes: Pre Run #3 pitot check - Pass
Post Run #3 Pitot check - Pass

Moisture Data

Mois e Data

Plant Reid Gardner
Location #4 Inlet B
Operator CH
Date 4/19/00
Run # 1
Barometric pressure
Probe Length 9'
Ambient Temp

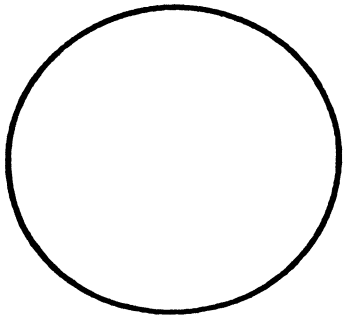
Disk #'s 150 & 151



Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O) ΔH	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O) ΔP	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
1	5	308.41	1.525	2.799	.393	108.49	110.89	55.02	3.9	250.49
2	5	310.03	1.359	5.702	.361	109.16	111.56	54.68	4.0	249.43
3	5	306.74	1.435	8.659	.409	110.22	112.49	55.28	4.0	245.73
4	5	304.54	1.450	11.576	.376	111.74	113.69	58.58	4.0	253.31
5	5	307.82	1.407	14.520	.428	112.81	114.54	59.73	4.1	248.77
6	5	319.43	1.389	17.345	.380	114.01	115.48	60.93	~~3~~4.0	242.38
7	5	321.10	1.431	20.275	.380	114.81	116.41	62.40	3.9	249.57
8	5	331.58	1.441	23.212	.422	115.92	117.08	63.02	4.0	253.84
9	5	326.05	1.468	26.077	.387	116.45	117.48	64.23	3.9	245.73
10	5	338.74	1.362	29.051	.367	116.85	118.01	65.56	3.9	241.85
11	5	340.94	1.453	32.054	.450	117.52	118.59	66.45	4.1	250.10
12	5	342.61	1.435	35.098	.387	118.19	119.12	67.65	3.9	251.15

Mois ..e Data

Plant Reid Gardner
Location #4 Inlet B
Operator CH
Date 4/19/00
Run # 1
Barometric pressure
Probe Length 9'
Ambient Temp



Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O) ΔH	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O) Δp	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
13 A	5	335.99	1.471	38.125	.407	118.86	119.79	61.33	4.1	247.98
14 B	5	342.07	1.546	41.143	.446	118.99	119.92	58.84	4.2	249.04
15 C	5	348.14	1.456	44.164	.420	119.26	120.32	59.24	4.2	250.62
16 D	5	360.83	1.552	47.133	.380	119.39	120.06	59.87	4.2	249.04
17 E	5	355.30	1.513	50.069	.420	119.52	120.59	59.60	4.0	249.30
18 F	5	342.07	1.477	53.042	.424	119.39	120.32	60.53	4.1	250.49
19 G	5	366.91	1.447	55.932	.365	119.39	120.19	61.87	4.0	248.77
20 H	5	342.07	1.407	58.776	.343	119.39	120.32	60.67	4.0	249.57
21 I	5	366.32	1.377	61.704	.431	119.52	120.46	60.27	4.0	249.57
22 J	5	361.91	1.404	64.567	.382	119.66	120.59	60.93	3.9	248.51
23 K	5	353.63	1.374	67.404	.376	119.66	120.46	61.60	4.0	250.10
24 L	5	361.91	1.428	70.435	.463	119.79	120.72	61.20	4.2	250.10
25	5	351.43	1.444	73.410	.407	120.19	120.86	61.33	4.0	249.83
						116.98	118.17			
	125.0	339.62	1.442		.397			61.13	4.2	249.06

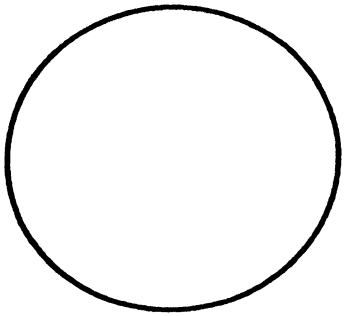
Vm = 73.418
Vs = 45.25
$\sqrt{\Delta p}$ = .430
Abs stack = 27.39
Avg. meter pres = 28.884

Vmstd = 64.301
%Iso = 98.87

Mois e Data

Plant Reid Gardner
Location #4 Inlet B
Operator CH
Date 4/20/00
Run # 2
Barometric pressure
Probe Length 9'
Ambient Temp

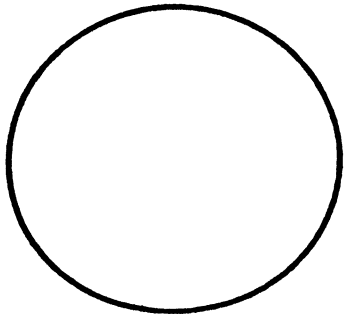
Disk #s 127 & 128



Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O) ΔH	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O) ΔP	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
1	5	277.99	1.419	2.906	.411	89.90	92.70	55.02	3.5	250.26
2	5	274.73	1.531	5.961	.511	91.54	94.43	53.06	3.7	246.79
3	5	281.74	1.516	9.035	.411	93.28	96.30	56.22	3.8	249.30
4	5	295.27	1.450	12.081	.402	95.94	98.48	58.98	3.4	251.02
5	5	280.15	1.368	15.086	.505	97.59	100.21	61.87	3.6	249.17
6	5	294.74	1.601	18.018	.361	98.66	101.06	63.56	3.2	249.04
7	5	299.06	1.507	20.991	.472	100.26	102.53	63.42	3.3	250.49
8	5	308.49	1.422	24.117	.400	100.66	102.29	63.83	3.6	247.72
9	5	310.61	1.694	27.410	.509	102.04	103.60	64.63	4.0	252.21
10	5	304.54	1.564	30.710	.457	102.71	104.26	65.29	3.9	248.77
11	5	318.89	1.685	34.124	.564	104.98	106.44	61.73	3.9	249.70
12	5	313.82	1.673	37.625	.573	105.64	106.98	60.53	3.9	247.32

Mois e Data

Plant	Reid Gardner
Location	#4 Inlet B
Operator	CH
Date	4/20/00
Run #	2
Barometric pressure	
Probe Length	9'
Ambient Temp	



Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O) ΔH	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O) ΔP	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
13 1	5	329.38	1.673	41.030	.579	105.95	107.24	60.27	4.2	255.16
14 2	5	322.18	1.860	44.390	.509	105.64	106.98	60.27	3.9	248.24
15 3	5	326.05	1.670	47.756	.584	107.02	108.04	60.40	4.2	244.94
16 4	5	327.17	1.628	51.067	.441	107.16	108.18	60.80	3.7	254.37
17 5	5	337.07	1.652	54.226	.525	107.69	108.58	61.20	3.7	250.89
18 6	5	329.38	1.507	57.514	.402	108.49	109.25	61.87	3.9	246.79
19 7	5	337.66	1.419	60.500	.487	108.36	109.51	59.24	3.6	252.47
20 8	5	344.27	1.401	63.522	.372	108.36	109.69	58.04	3.5	248.91
21 9	5	326.05	1.386	66.576	.378	107.42	108.71	58.18	3.7	247.45
22 10	5	333.79	1.410	69.894	.393	107.62	108.31	58.58	3.7	251.68
23 11	5	341.48	1.489	73.276	.568	107.69	108.58	58.04	3.9	260.76
24 12	5	333.20	1.652	76.711	.490	107.96	108.04	59.24	4.1	247.06
25	5	327.17	1.649	80.048	.511	107.29	106.98	59.87	4.2	251.42
	125	316.75	1.573		.483	103.51	104.99	60.38	4.1	249.64

$V_s = 49.18$ AVE meter Press = 28.834 $\overline{\sqrt{\Delta P}} = 0.694$

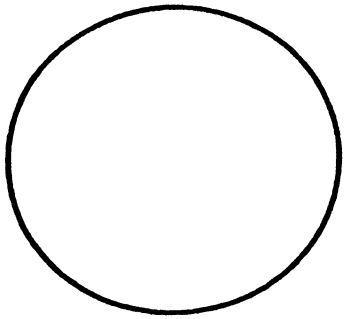
$V_m = 80.048$ AVE Abs Stack Press = 27.35

$V_{mstd} = 70.135$ $\%I_{SO} = 96.52$

Mois e Data

Plant Reid Gardner
Location #4 Inlet B
Operator CH
Date 4/25/00
Run # 3
Barometric pressure
Probe Length 9'
Ambient Temp

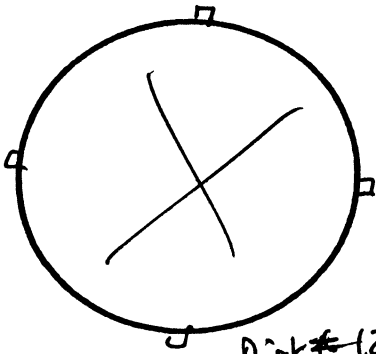
Disk #s 123 & 124



Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O)	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O)	Gas Sample Temp. at dry gas meter (deg. F)		Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
						Inlet	Outlet			
1	5	298.53	1.410	2.811	0.452	83.98	86.80	56.08	4.3	247.32
2	5	299.06	1.438	5.858	0.466	84.78	86.20	55.55	4.4	252.65
3	5	300.16	1.601	8.826	0.417	85.98	87.14	56.71	4.4	248.77
4	5	300.69	1.537	11.861	0.433	87.23	88.25	58.71	4.6	248.24
5	5	301.75	1.573	14.861	0.444	88.69	89.72	59.73	4.4	251.95
6	5	299.59	1.519	17.864	0.415	90.69	91.59	60.00	4.3	249.04
7	5	300.69	1.534	20.876	0.428	93.54	94.43	60.53	4.3	250.36
8	5	311.61	1.555	24.020	0.503	95.41	96.03	61.20	4.6	251.55
9	5	310.61	1.498	27.099	0.439	97.32	97.68	62.40	4.4	249.43
10	5	303.41	1.555	30.411	0.479	99.06	99.28	59.87	4.7	249.17
11	5	311.69	1.474	33.464	0.612	101.11	101.46	59.24	4.7	249.96
12	5	331.58	1.371	36.423	0.367	101.91	102.39	59.73	4.2	252.34

RUN #1 Moi[illegible]e Data

Plant	RGS
Location	RG4 Stack
Operator	JR/CH
Date	4-19-00
Run #	1
Barometric pressure	28.16
Probe Length	15'
Ambient Temp	72°F



$\eta_{o\,ISO} = 100.77\%$

$V_s = 48.17$ Ft/sec

Ag meter press: 28.277

Abs Stk Press: 28.62

$V_{CORR} = 09.294$

Disk # 129/10

* Stack temp varied between 140-150

Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F) *	Pressure differential across orifice meter (inches H2O)	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O)	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Gas Sample Temp. at dry gas meter (deg. F) Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
A 1	10.0	146.61	2.744	7.828	0.578	82.82	81.09	62.61	4.1	245.35
2	10.0	141.28	2.568	15.906	0.791	82.93	82.55	59.11	4.2	241.10
3	10.0	140.21	2.680	23.882	0.621	81.62	81.89	61.78	4.2	245.25
B 4	10.0	147.62	2.605	31.851	0.553	82.55	81.09	58.71	4.3	246.08
5	10.0	140.21	2.388	39.787	0.659	81.22	80.82	61.65	4.5	244.85
6	10.0	140.23	2.623	47.820	0.684	81.22	80.69	61.24	4.7	245.38
C 7	10.0	140.73	2.791	55.792	0.562	82.82	81.75	69.74	4.8	245.71
8	10.0	141.25	2.442	63.889	0.607	84.20	82.69	61.11	5.0	245.64
9	10.0	141.82	2.334	71.971	0.718	83.67	82.82	64.58	5.4	242.29
D 10	10.0	140.73	2.442	79.981	0.738	83.93	83.22	62.58	5.4	246.35
11	10.0	134.69	2.430	87.945	0.627	86.74	84.20	60.04	5.5	245.38
12	10.0	140.73	2.529		0.664	87.14	85.00	61.24	5.5	245.91
	120.0	146.35	2.423	95.890	0.612	83.60	82.53	64.75		248.77

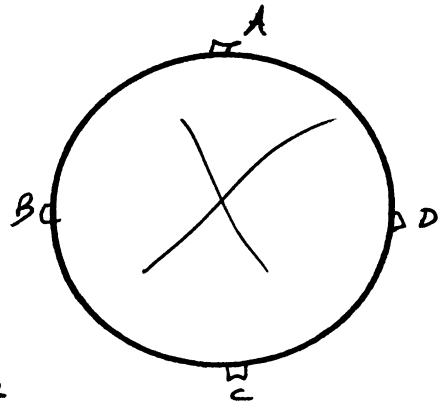
Run #2

Moi[illegible]e Data

Plant	RCS
Location	RC4 Stack
Operator	JR/CH
Date	4-20-00
Run #	2
Barometric pressure	28.50
Probe Length	15'
Ambient Temp	65°F

Disk #'s: 125/130

%ISO = 100.95 %



V_s = 46.02

[illegible] meter press = 28.262

lbs stk press = 28.53

V_{corr} = 85.791

Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O)	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O)	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
D 1	10.0	140.73	2.069	7.516	0.564	90.34	90.07	57.51	3.4	239.21
2	10.0	140.73	2.153	15.392	0.501	93.59	[illegible]92.08	58.18	3.7	249.96
3	10.0	142.34	2.388	23.401	0.512	93.72	92.47	61.38	3.9	249.57
C 4	10.0	142.34	2.204	31.259	0.530	94.52	92.74	63.25	4.2	248.91
5	10.0	141.82	2.141	39.203	0.614	97.46	94.88	62.71	4.3	250.36
6	10.0	141.82	2.340	47.204	0.632	97.59	94.74	62.58	4.5	249.96
B 7	10.0	142.34	2.394	55.077	0.569	98.39	95.68	60.04	4.5	250.49
8	10.0	143.38	2.662	62.879	0.546	98.26	95.54	59.51	4.6	251.73
9	10.0	141.82	2.261	70.811	0.618	99.99	96.75	56.44	4.6	250.23
A 10	10.0	142.34	2.180	78.689	0.544	99.99	97.28	55.64	4.6	248.77
11	10.0	142.34	2.255	86.474	0.555	100.13	97.28	55.37	4.7	250.36
12	10.0	142.86	2.081	94.	0.548	94.39	92.74	55.24	4.7	249.96
	120.0	142.21	2.262	94.236	0.561	96.38	94.16	58.89		249.75

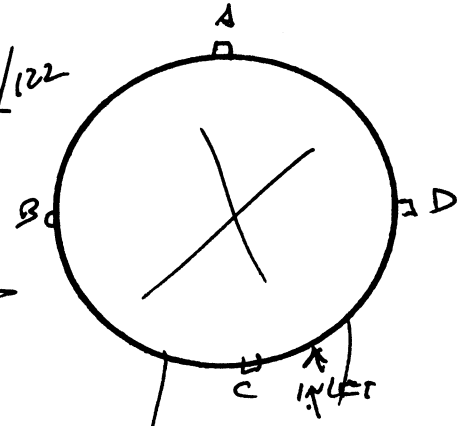
Run 3

Moi e Data

Plant	RGS
Location	RG4
Operator	JR/CH
Date	4-25-00
Run #	3
Barometric pressure	28.06
Probe Length	15'
Ambient Temp	75°F

Disk #'s: 126/124/122

%ISO = 99.22



U_s = 49.18

meter press = 28.226

abs stk. press = 28.48

V_{CORR} = 89.431

Traverse Point	Elapsed Sampling Time (minutes)	Stack Temperature (deg. F)	Pressure differential across orifice meter (inches H2O)	Dry Gas meter sample volume (cubic feet)	Velocity Head (inches H2O)	Gas Sample Temp. at dry gas meter (deg. F) Inlet	Outlet	Impinger Outlet Temp. (deg. F)	Pump Vacuum (in. Hg)	Filter Temp. (deg. F)
A 1	10.0	140.21	2.319	8.082	0.698	75.61	75.08	67.21	3.6	246.75
2	10.0	141.25	2.737	16.345	0.745	78.55	76.42	57.51	3.9	242.26
3	10.0	140.73	2.674	24.416	0.652	80.02	77.22	57.01	4.1	244.85
B 4	10.0	140.73	2.322	32.495	0.700	82.15	78.95	54.62	4.1	247.54
5	10.0	141.25	2.466	40.651	0.709	83.53	80.28	54.48	4.3	245.51
6	10.0	142.34	2.270	48.724	0.582	83.35	80.28	54.08	4.4	245.91
C 7	10.0	142.34	2.584	56.817	0.779	83.13	80.82	53.95	4.6	245.11
8	10.0	141.25	2.463	64.932	0.702	85.27	82.02	54.71	4.6	246.75
9	10.0	141.25	2.550	72.964	0.650	85.00	81.75	55.51	4.7	247.27
D 10	10.0	141.82	2.255	81.077	0.598	85.00	82.15	55.92	4.6	247.27
11	10.0	141.25	2.481	89.217	0.668	85.27	82.29	53.41	4.7	247.67
12	10.0	141.25	2.370	0	0.580	86.20	83.09	53.41	4.8	245.38
	120.0	145.77	2.437	97.244	0.636	83.32	80.41	60.46	4.8	251.34

Run Time Data Sheets

Run Time Data

Plant	Reid Gardner
Location	INLET
Operator	
Date	
Run #	1-2-3
Barometric Pressure	
Probe Length	9
Ambient Temp	

Run #		Start Time	End Time
1	4/19	11:52	13:57
2	4/20	10:42	12:47
3	4/25	10:26	12:31
4			
5			
6			
7			
8			
9			

Notes:

Run Time Data

Plant	RCS
Location	RC4 Stack
Operator	JR/CH
Date	4-19-00
Run #	1
Barometric Pressure	29.46
Probe Length	15'
Ambient Temp	72°F

Run #		Start Time	End Time
1	4-19	1152	1501
2	4-20	1041	1250
3	4-25	1026	1235
4			
5			
6			
7			
8			
9			

Notes:

APPENDIX-C

Control Room Log Records
Chain of Custody Records

Control Room Log Records

NEVADA POWER COMPANY

Reid Gardner Station — **Control Room Log** — **Date** 4/19/2000

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Generator Megawatts Gross	290	290	290	290	290	290	290	290	290	290	140	270	290	290	290	290	290	290	290	290	290	290	290	290	290
Generator Megawatts Net	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266	266
Generator MegaVars Gross	49	52	54	58	62	62	65	63	63	72	72	73	73	74	74	74	75	75	75	78	78	96	82	85	78
Generator Amperes	7.1	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.4	7.3	7.3	7.3	7.3	7.4	7.3	7.3	7.3	7.3	7.4	7.4	7.4	7.4	7.4	7.3
Generator Volts	24.9	24.9	24.8	24.8	24.8	24.9	24.9	24.8	24.8	24.7	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.6	24.6	24.6	24.6	24.6	24.8
Generator Field Amperes DC	37	37	36	37	38	39	38	38	38	38	39	39	40	40	40	40	39	39	39	40	42	41	40	40	39
Generator Field Volts DC	39	39	39	40	40	40	40	40	40	40	40	40	41	41	41	41	41	41	41	42	42	43	42	42	40
Auxiliary Volts X	7200	7220	7210	7220	7220	7200	7200	7200	7200	7200	7200	7200	7200	7190	7190	7190	7190	7190	7175	7166	7160	7160	7167	7160	7200
Auxiliary Volts Y	4320	4320	4320	4310	4320	4320	4310	4310	4310	4310	4310	4310	4310	4300	4300	4300	4300	4300	4310	4300	4300	4290	4300	4320	4300
Auxiliary Volts Z	4330	4330	4320	4320	4310	4320	4310	4310	4310	4310	4310	4310	4310	4300	4300	4300	4300	4300	4300	4300	4300	4290	4290	4290	4300
Superheat Temperature	1009	1008	1006	1008	1007	1008	1011	1007	1010	1008	1008	1007	1007	1007	1007	1007	1007	1007	1007	1007	1007	1007	1003	1009	1009
Reheat Temperature	1011	1014	1008	1014	1005	1012	1009	1014	1012	1014	1014	999	997	1007	1007	1007	1007	1007	1007	1007	1007	996	998	1000	1000
Throttle Pressure	2430	2421	2415	2416	2430	2417	2426	2422	2422	2420	2420	2420	2414	2420	2420	2420	2420	2420	2420	2420	2420	2420	2426	2428	2429
FD Fan Damper %	54	54	54	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	54	53
ID Fan Damper %	55	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	56
Combined O_2 %	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	3.0	2.8	3.1	3.1	3.1	3.2	3.1	3.0	3.0	3.0	2.9	2.9	3.0	3.0
Air Flow	66	66	66	66	66	66	66	66	66	66	66	66	66	67	67	67	67	67	67	67	67	67	67	67	67
Mill A Capacity Damper	40	40	40	40	40	40	39	39	39	39	39	39	40	39	39	40	40	40	40	40	40	41	40	40	40
Mill B Capacity Damper																									
Mill C Capacity Damper	45	45	45	45	45	45	45	45	45	45	45	45	46	46	46	46	46	46	46	46	46	47	46	45	45
Mill D Capacity Damper	30	29	29	30	30	30	29	29	29	29	30	29	30	30	30	30	31	31	31	31	32	32	30	30	29
Steam Flow	2300	2340	2300	2300	2300	2360	2300	2290	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2325	2305	2325	2300
Feedwater Flow	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
Condensate Flow	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1425	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1428	1400	1460
Turbine Backpressure "Hg.	2.78	2.76	2.74	2.75	2.69	2.67	2.69	2.70	2.71	2.75	2.75	2.75	2.67	2.70	2.70	2.71	2.71	2.73	2.69	2.80	2.81	2.79	2.77	2.71	2.69
Main Transformer Meter	9830	10446	10712	11068	11441	9220	7852	7762	8014	8224	8548	8915	9076	9263	9398	9548	9658	9411	9611	9760	9870	1460	1725	1995	2062

RG4LogSheet.xls Sheet("RG-4 CR LOG") Main Control Room Log 2/99 (EXCEL)

0000-0500 Finchamson 0600-1700 [signature] 1800-2400 J.R. JH

NEVADA POWER COMPANY

REID GARDNER STATION FGD LOG

DATE: 4-17-00

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Megawatts	287	287	287	287	287	287	287	288	287	288	287	288	287	287		288	287	287	287	288	288	288	288	288	285
Scrubber Inlet Temp	310	305	300	307	300	300	300	300	300	300	300	303	305	310		320	320	320	320	320	320	320	320	318	305
"C" Abs. Tray Diff. Press	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Outlet Temp	135	136	137	137	136	136	136	138	136	136	136	136	138	138		138	138	138	138	138	131	138	138	138	137
Slurry pH	7	7	7	7	7	7	7	7	7	7	7	7	7	7		7	7	7	7	7	7	7	7	7	7
Inlet Mod Damp. Position	83	83	83	83	83	83	82	81	81	84	91	80	80	80		80	80	80	82	83	83	82	83	83	83
Slurry Density	.096	.094	.092	.09	.092	.096	.095	.093	.096	.094	.094	.092	.092	.096		.098	.096	.092	.091	.090	.094	.094	.093	.092	.096
"B" Abs. Tray Diff. Press																									
Outlet Temp																									
Slurry pH																									
Inlet Mod Damp. Position																									
Slurry Density																									
"A" Abs. Tray Diff. Press																									
Outlet Temp	138	135	133	133	133	134	136	136	134	136	136	138	138	138		138	139	138	138	130	135	140	139	139	139
Slurry pH	7	7.1	7.1	7	7	7	6.9	6.9	7.1	7	7	7	6.9	6.8		6.9	6.9	7.0	6.9	7.1	7.1	6.9	7.1	7.1	6.9
Inlet Mod Damp. Position	83	83	82	82	82	84	83	80	82	86	85	86	86	88		90	90	91	90	85	90	84	86	84	86
Slurry Density	.096	.094	.098	.098	.092	.098	.098	.100	.098	.098	.098	.100	.102	.104		.098	.096	.096	.100	.098	.096	.095	.098	.099	.098
Plenum Duct Press	9.8	9.8	7.7	9.7	9.5	7.5	9.6	9.6	9.5	9.4	9.7	9.7	9.6	9.6		9.4	9.5	9.6	9.6	9.7	9.2	9.6	9.8	9.7	9.5
Reheat Steam Flow	24.5	24.5	24.5	24.5	24.5	25	24	25	25	24	24	24	23	23		22	22	22	21.5	20.5	23	23	23	23	23.5
Scrubber Outlet Temp	150	150	150	150	150	150	150	150	150	150	150	150	150	150		150	150	150	150	150	150	150	150	150	150
Soda Ash Tank Level	31	31	31	31	31	30	31	31	31	31	32	31	31	31		31	31	31	31	31	31	31	51	31	31
Dilute Alkali Density	.131	.13	.131	.131	.131	.132	.126	.128	.127	.130	.129	.130	.130	.129		.127	.127	.128	.130	.130	.131	.130	.129	.129	.129
Opacity %	2.6	2.7	2.7	2.7	2.6	2.7	2.5	2.5	2.7	2.6	2.6	2.6	2.4	2.3		2.4	2.4	2.3	.23	2.3	2.4	2.3	2.5	2.5	2.5
Nox lbs.	.356	.378	.373	.33	.32	.324	31	31	.31	30	.30	.31	.31	.31		.32	.32	.32	.33	.32	.32	.36	.33	.31	.32
So2 Removal Rate %	87.6	94.7	88.6	88.4	88.11	88.1	88.1	88.3	88.3	87.8	87.5	87.5	87.4	87.6		87.8	87.6	87.3	82.9	82.6	87.6	87.4	85	87	87
N. B/H Inlet Press	-9.6	-8.8	-8.4	-9.5	-9.4	-9.1	9.1	8.9	8.3	8.5	8.5	9.0	9.1	9.1		9.1	9.1	9.2	-9.9	-8.6	-9.5	-9.0	9.3	9.1	9.7
S. B/H Inlet Press	-8.4	-9	-8.4	-8.6	-8.0	-8.8	8.0	8.2	8.2	8.5	8.7	8.7	8.7	8.7		8.7	8.5	8.5	-8.0	-8.1	-9.0	-8.4	9.1	9.1	8.0
N. B/H Sys. Diff. Press	8.1	7.9	7.4	8	6.9	7.6	7.2	7.0	7.8	7.4	8.1	8.0	8.0	7.9		8.3	8.6	7.7	8.0	8.3	7.7	8.0	7.9	7.8	8.7
S. B/H Sys. Diff. Press	7.2	7.2	7.4	7.4	6.4	6.9	7.0	6.4	7.6	8.0	7.5	7.9	7.9	7.8		8.1	7.8	7.3	8.6	8.6	7.6	7.6	8.0	8.1	7.4

RG4FORMS XLS RG-4 FGD 1/97 REVISED 5/99

00-05 Rehmer

06-17 Salazar

18-24 [signature]

NEVADA POWER COMPANY

REID GARDNER STATION UNIT #4
MAIN CONTROL ROOM LOG

DAY 0600 - 1800 DATE : April/19/2000

	O.P.T.C.	C.O.	A.O.
NAMES :	R.POSTLETHWAIT	T.ROBISON	S.SANDBERG

UNIT #4: 290 MW's

STATUS:

A,C, &D MILLS, A &C BFP, B HOTWELL PUMP, IN SERV. A BFP MIN. RECIRC. VALVED OUT AT DA. ABS. AND B/H IN SERVICE

TIME	
0610	Held Tailboard Meeting
0700	I/C# RG4 00 7441 4A HP Ash Pump
1100	I/C# RG4 00 7442 4B Mill Lube Oil System
1235	Filled Coal Silo's
1545	R/C# RG4 00 7441
1725	Filled Coal Silo's
	Blew Extra Soot

C.O / A.C.O. Initial's _____ C.O. / A.C.O. T.ROBISON

NEVADA POWER COMPANY

REID GARDNER STATION UNIT NO. 4
DAILY LOAD DEVIATION LOG

Gross Load

Date: 4/19/2000

TIME	[illegible]	[illegible]	[illegible]	[illegible]	05	06	07	08	[illegible]	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Max. Obtainable Load	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	301	301	301	[illegible]	301	301	301	301	301	301	301	301	301	301	301	301	301	301
Disp. Demand	[illegible]	[illegible]	[illegible]	[illegible]	290	290	290	290	[illegible]	290	290	290	290	290	290	290	290	290	290	290	290	290	290

* Maximum Load on Unit #4 is 301 MWe Gross

REMARKS

Load Control Plot

0000		1200	
0100		1300	
0200		1400	
0300		1500	
0400		1600	
0500		1700	
0600		1800	
0700		1900	
0800		2000	
0900		2100	
1000		2200	
1100		2300	

COMMENTS

RG4LogSheets.xls Sheet("DEVIATION") Deviation Log 2000 (EXCEL)

0000-0600 Finished 0600-1800 [signature] 1800-2400 J.R. JH

NEVADA POWER COMPANY

Reid Gardner Station — **Control Room Log** — **Date** 4/20/2000

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Generator Megawatts Gross	290	290	290	290	290	290	290	290	290	290	291	290	290	290	290	290	290	290	290	290	290	290	290	290	284
Generator Megawatts Net	266	265.8	265	266	266	266	266	267	267	267	267	267	267	267	267	267	267	267	267	266	266	266	266	266	260
Generator MegaVars Gross	78	68	68	55	67	69	66	65	76	78	80	82	82	25	25	25	63	67	55	53	69	64	60	64	60
Generator Amperes	7.3	7.3	7.2	7.2	7.2	7.2	7.2	7.2	7.2	23	7.2	7.3	7.4	7.3	7.3	7.2	7.2	7.3	7.2	7.2	7.3	7.2	7.2	7.2	7.1
Generator Volts	24.8	24.8	24.7	24.7	24.6	24.8	24.8	24.8	24.7	24.6	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.9	24.8	24.8	24.9	24.9	24.9
Generator Field Amperes DC	39	38	38	37	35	39	38	38	39	39	40	40	40	39	39	38	38	39	38	38	39	38	38	38	37
Generator Field Volts DC	40	41	41	41	40	40	41	40	41	41	42	43	43	42	42	41	41	41	40	40	41	40	40	40	39
Auxiliary Volts X	7200	7150	7150	7000	7200	7200	7200	7200	7180	7150	7205	7205	7170	7180	7160	7200	7200	7200	7200	7205	7200	7200	7200	7200	7200
Auxiliary Volts Y	4330	4340	4320	4330	4330	4310	4320	4340	4330	4310	4313	4310	4291	4310	4320	4320	4320	4320	4320	4320	4300	4310	4320	4330	4320
Auxiliary Volts Z	4340	4340	4310	4316	4320	4300	4310	4340	4300	4300	4300	4290	4290	4310	4310	4310	4310	4310	4310	4305	4300	4210	4315	4335	4320
Superheat Temperature	1009	1008	999	1010	1012	1013	1006	1002	1014	1015	1019	1008	1019	1003	1000	1004	1003	1008	1001	999	1006	998	1017	1018	1006
Reheat Temperature	1000	1013	1015	1000	1004	1007	1010	1011	1004	1002	1005	1000	1003	1004	1007	1007	995	991	1009	1000	1019	1016	1009	993	995
Throttle Pressure	2429	2425	2401	2423	2422	2420	2420	2423	2425	2428	2430	2424	2427	2428	2423	2422	2426	2425	2430	2435	2438	2424	2435	2430	2422
FD Fan Damper %	54	55	55	55	58	54	52	53	53	52	55	54	52	53	53	53	52	54	55	55	55	55	55	55	52
ID Fan Damper %	56	56	55	55	54	55	54	55	54	55	55	53	51	57	51	55	55	56	56	57	56	56	54	56	54
Combined O_2 %	3.0	3.0	2.8	2.8	2.7	2.9	2.4	3.2	2.9	2.8	2.8	2.8	3.0	2.5	2.6	2.6	2.5	2.5	2.5	2.5	2.7	2.5	2.6	2.7	2.6
Air Flow	67	66	67	67	67	67	65	66	67	66	67	65	66	67	67	66	66	65	66	66	66	67	67	66	65
Mill A Capacity Damper	40	40	39	39	39	39	39	39	39	37	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Mill B Capacity Damper	—	.	-																						
Mill C Capacity Damper	45	44	45	45	45	45	45	46	46	45	44	46	46	46	47	43	44	43	44	44	44	45	45	43	42
Mill D Capacity Damper	29	29	27	27	27	27	27	26	26	7	28	29	29	29	27	32	32	26	29	29	30	30	30	28	26
Steam Flow	2330	2330	2324	2300	2340	2330	2300	2300	2320	2320	2300	2320	2320	2300	2310	2300	2300	2310	2330	2330	2330	2300	2300	2300	2280
Feedwater Flow	2200	2200	2200	2200	2200	2200	2200	2240	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2175
Condensate Flow	1450	1430	1410	1430	1420	1450	1410	1420	1410	1412	1400	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1425	1450	1400	1400
Turbine Backpressure "Hg.	2.67	2.64	2.65	2.60	2.57	2.52	2.75	2.74	2.81	2.56	2.78	3.16	3.19	3.17	3.32	3.34	3.30	3.21	2.77	2.73	2.80	2.80	2.80	2.77	2.70
Main Transformer Meter	2264	25115	2987	3060	334	73595	3841	4143	4583	4647	4730	5181	5241	5702	5981	6248	6525	6272		7909	7578	7842	8107	8380	8632

RG4! ~~Sheet.xls Sheet("RG-4 CR LOG") Main Control Room Log 2/99 (EXCEL)

0000-0500 _____ 0600- _____ 1800-2400 _____

NEVADA POWER COMPANY

REID GARDNER STATION FGD LOG

DATE: 4-20-00

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Megawatts	288	287	287	288	287	287	288	287	284	288	244	284	284	284	286	284	287	268	280	288	287	288	282	2[illegible]	[illegible]
Scrubber Inlet Temp	305	305	300	300	300	300	310	310	312	312	312	316	320	324	326	330	336	336	330	330	330	336	325	[illegible]	[illegible]
"C" Abs. Tray Diff. Press	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	[illegible]	[illegible]
Outlet Temp	137	136	136	136	137	137	137	138	138	138	138	138	139	138	139	139	139	139	139	139	139	139	[illegible]	[illegible]	[illegible]
Slurry pH	7	7	7	7	7	7	7.	7.	7.	7.0	7.0	7.0	7.0	7.1	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	[illegible]	[illegible]
Inlet Mod Damp. Position	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	82	83	83	83	83	[illegible]	[illegible]	[illegible]
Slurry Density	.096	.097	.094	.094	.092	.090	.095	.091	.098	.098	.098	.098	.096	.092	.091	.091	.090	.094	.094	.096	.096	.092	.096	[illegible]	.10
"B" Abs. Tray Diff. Press																									
Outlet Temp																									
Slurry pH																									
Inlet Mod Damp. Position																									
Slurry Density																									
"A" Abs. Tray Diff. Press																									
Outlet Temp	139	138	137	137	136	136	133	136	136	136	136	139	138	139	138	138	139	140	140	MD	140	140	140	[illegible]	[illegible]
Slurry pH	6.9	7.2	7.1	6.8	7.1	7.2	7.0	7.1	7.2	7.1	7.1	7.2	7.1	7.1	7.1	7.0	7.0	7.1	7.0	7.0	7.0	[illegible]	[illegible]	[illegible]	[illegible]
Inlet Mod Damp. Position	86	84	83	82	82	83	90	84	83	84	85	87	87	86	86	86	86	86	86	86	86	[illegible]	[illegible]	[illegible]	[illegible]
Slurry Density	.098	.100	.093	.097	.098	.099	.095	.104	.100	.101	.101	.101	.098	.103	.098	.098	.105	.102	.102	.100	.098	.110	.102	.101	.104
Plenum Duct Press	9.5	9.6	9.4	9.6	9.5	9.5	9.6	9.6	9.6	9.6	9.5	9.5	9.5	9.6	9.6	9.6	9.7	9.9	9.8	9.8	9.8	9.8	9.8	[illegible]	[illegible]
Reheat Steam Flow	23	24	24	24	24	24	25	24	25	25	24	22.5	22.5	22	22	22	22	21.5	22	22	22	22	22	23	23
Scrubber Outlet Temp	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Soda Ash Tank Level	21	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	[illegible]	31
Dilute Alkali Density	.129	.129	.129	.129	.129	.129	.128	.129	.129	.129	.130	.130	.129	.126	.128	.128	.129	.127	.127	.128	.128	.128	.127	.127	.127
Opacity %	2.5	2.6	2.6	2.7	2.8	2.8	2.7	2.7	2.6	2.5	2.3	2.2	2.2	2.1	2.1	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.3	2.3
Nox lbs.	.32	.32	.33	.32	.32	.31	.31	.32	.32	.31	.30	.30	.31	.31	.31	.31	.31	.31	.31	.31	.31	.31	.31	.31	.31
So2 Removal Rate %	87	88	88	88	88	88	88.7	88.1	88.5	88.	84.8	96.9	87.9	87.7	87.7	87.6	87.3	87.6	89.2	88.1	88.1	88.1	88.2	87.1	
N. B/H Inlet Press	9.7	8.8	8.6	9.0	9.1	9.1	8.9	9.3	9.0	9.0	9.1	8.8	8.6	8.6	8.7	9.3	9.5	9.1	-8.8	-9.0	-8.5	-9.1	-9.4	-9.2	-9.3
S. B/H Inlet Press	8.0	8.1	8.1	8.6	8.2	8.0	8.2	8.1	8.2	8.1	8.3	8.6	7.5	7.6	8.5	8.5	7.8	7.9	-8.1	-8.3	-8.3	7.6	-7.7	[illegible]	-7.7
N. B/H Sys. Diff. Press	8.9	7.1	6.9	7.1	8.2	8.1	6.9	8.4	7.2	7.4	7.5	7.9	7.9	7.4	8.3	7.8	8.7	7.9	8.8	8.5	8.5	[illegible]	[illegible]	[illegible]	[illegible]
S. B/H Sys. Diff. Press	7.4	6.1	6.4	6.6	6.8	7.1	6.5	7.4	6.5	7.6	7.2	7.1	7.5	7.1	8.5	7.2	7.4	7.9	8.7	8.6	8.7	8.1	8.4	8.1	[illegible]

FMS XLS RG 4 FGD 1/97 REVISE 5/00

00-05 DG

-17

18-24

NEVADA POWER COMPANY

REID GARDNER STATION UNIT #4
MAIN CONTROL ROOM LOG

DAY 0600 - 1800 DATE : April/20/2000

	O.P.T.C.	C.O.	C.O.	A.O.
NAMES :	M.FETHERSTON	J.TELLES	K.WOODS	K.STAPLEY

UNIT #4: 267 MW's

STATUS:

A,C, &D MILLS, A &C BFP, B HOTWELL PUMP, IN SERV. A BFP MIN. RECIRC. VALVED OUT AT DA. ABS. AND B/H IN SERVICE

TIME	
0600	HELD TAILBOARD MTG
0812	ISS/CL #7444 #2 REACT C- SLUDGE PUMP
0815	ISS/CL #7443 B-H.P. ASH PUMP
1120	REL/C # 7444 C- SLUDGE PUMP
1125	ISS/ CL #7445 AUX STEAM FROM UNITS 123 TO UNIT #4 TRAP
1130	FILLING COAL SILOS
1600	REL/C # 7443 B HIGH PRESSURE ASH PUMP FOR EMERGENCY USE ONLY, NO SEAL H2O
1700	FILLING COAL SILOS

C.O / A.C.O. Initial's _____ C.O. / A.C.O. J.TELLES

NEVADA POWER CO ANY

REID GARDNER STATION UNIT NO. 4
DAILY LOAD DEVIATION LOG

Gross Load

Date: 4/20/2000

TIME	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Max. Obtainable Load	[illegible]					301	301	301	[illegible]	[illegible]	301	301	[illegible]	301	301	[illegible]	301	301	301	301	301	301	301	301
Disp. Demand	[illegible]					290	290	290	[illegible]	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290

* Maximum Load on Unit [illegible]

REMARKS

0000	LC / PD	1200	
0100		1300	
0200		1400	
0300		1500	
0400		1600	
0500		1700	
0600		1800	
0700		1900	
0800		2000	
0900		2100	
1000		2200	
1100		2300	

COMMENTS

RG4LogSheets.xls Sheet("DEVIATION") Deviation Log 2/99 (EXCEL)

0000-0600 [signature] 0600-1800 [signature] 1800-2400 [signature]

NEVADA POWER COMPANY

REID GARDNER STATION UNIT #4
MAIN CONTROL ROOM LOG

DAY 0600 - 1800 DATE : April/25/2000

NAMES : POSTMA TURLEY HARDY

UNIT #4: 290 MW's

STATUS:

A,C, &D MILLS, A &C BFP, B HOTWELL PUMP, IN SERVICE
ABS. AND B/H IN SERVICE A,B,C, CIRC. PUMPS IN SERVICE
A-BFP MIN. RECIRC. VALVED OUT @ D.A.

TIME	
0600	TAILBOARD MEETING
0630	230 MW'S NET P/D
0740	266 MW'S NET P/D
1150	R/CL.# RG4 00 7450
1200	FILLED SILO'S
1253	C1 SILO LOW ALARM IN
1340	I/CL. #RG4 00 7453 C1 COAL SILO K-RAY'S
1545	C1 SILO IS EMTY MAINT. OPENED IT UP GATE WAS 80% CLOSED
	THEY OPENED IT UP TO 80% OPEN, THAT SHOULD WORK BETTER DROPPED LOAD TO 250MW'S N
FYI	MR. DORINO IS WORKING ON A NEW SOOT BLOWING SEQ. # 16 IN AN ATTEMPT TO
	LOWER FURNACE EXIT GAS TEMP. WE TEST RAN IT TODAY HE WILL MAKE SOME
	MODIFICATIONS TOMORROW, THE IDEA IS TO KEEP GAS TEMP. BELOW THE ASH
	FUSION TEMP. FOR SUFCO COAL SO IT WON'T BE SO STICKY.
1640	A1 SILO BACK IN SERVICE FULL LOAD P/D.
1650	R/CL. #RG4 00 7453 FILLED SILO'S

C.O / A.C.O. Initial's KC C.O. / A.C.O. TURLEY

NEVADA POWER CO[illegible]ANY

Reid Gardner Station — **Control Room Log** — **Date** 4/25/2000

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Generator Megawatts Gross	280	280	280	280	280	[illegible]	290	255	288	[illegible]	289	289	289	289	289	289	273	273	298	298	298	298	298	291	291
Generator Megawatts Net	[illegible]	265	265	265	[illegible]	[illegible]	266	232	266	[illegible]	266	266	266	266	266	265	250	250	275	274	273	272	272	267	268
Generator MegaVars Gross	77	74	65	65	65	70	68	61	70	60	60	65	65	65	65	64	58	66	70	73	65	75	75	80	70
Generator Amperes	7.4	7.4	7.4	7.4	7.4	7.4	7.2	6.4	7.3	7.2	7.2	7.2	7.2	7.2	7.2	7.2	6.8	6.9	7.4	7.4	7.4	7.4	7.4	7.4	7.3
Generator Volts	[illegible]	[illegible]	[illegible]	[illegible]	24.8	24.8	24.8	24.9	24.9	[illegible]	24.9	24.9	24.9	24.9	24.9	24.8	24.7	24.7	24.7	24.8	24.8	24.7	24.7	24.7	24.7
Generator Field Amperes DC	[illegible]	[illegible]	[illegible]	35	35	35	39	36	39	[illegible]	38	38	39	38	38	39	38	38	40	40	40	40	40	40	39
Generator Field Volts DC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40	37	41	40	40	40	41	40	40	41	41	40	43	43	43	43	43	43	42
Auxiliary Volts X	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7200	7215	7198	[illegible]	7220	7000	7000	7200	7200	7180	7190	7195	7160	7180	7160	7155	7155	7155	7160
Auxiliary Volts Y	4320	4320	4320	4320	4320	4320	4320	4322	4318	4320	4320	4320	4310	4300	4300	4300	4310	4310	4320	4300	4310	4290	4280	4280	4290
Auxiliary Volts Z	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4320	4320	4310	4320	4320	4320	4300	4300	4300	4300	4300	4310	4320	4300	4300	4290	4290	4290	4300
Superheat Temperature	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1008	1008	1013	[illegible]	1003	1003	992	1001	984	966	984	1001	1003	996	990	1006	1005	1004	988
Reheat Temperature	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1017	999	1002	[illegible]	1003	1008	1010	1000	985	974	980	997	1001	1000	998	996	998	1004	1000
Throttle Pressure	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2419	2413	2432	[illegible]	2412	2422	2414	2415	2430	2422	2420	2423	2444	2442	2438	2443	2448	2446	2439
FD Fan Damper %	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	54	49	57	[illegible]	55	55	55	55	55	55	54	54	54	55	57	57	56	53	54
ID Fan Damper %	58	58	60	57	60	60	60	49	55	60	60	58	60	60	61	57	55	57	57	58	58	60	58	55	55
Combined O_2 %	2.1	3.0	3.2	3.5	2.6	2.3	3.2	2.8	2.2	2.1	2.5	2.5	2.3	2.4	2.4	2.0	2.6	3.1	2.4	2.3	2.1	2.1	2.0	2.1	2.2
Air Flow	67	65	66	64	66	65	66	56	62	64	64	64	66	66	66	66	60	61	67	68	67	67	67	65	65
Mill A Capacity Damper	43	43	43	42	42	42	41	36	39	40	44	44	44	44	44	44	44	44	40	40	43	40	43	38	39
Mill B Capacity Damper																									
Mill C Capacity Damper	38	32	25	31	36	35	38	25	39	39	38	38	40	40	40	40	35	30	45	46	46	46	46	45	45
Mill D Capacity Damper	40	47	55	40	44	44	40	26	31	38	38	38	30	40	40	30	35	37	30	30	30	30	30	26	25
Steam Flow	2350	2350	2350	[illegible]	2350	2350	2350	2000	2335	[illegible]	2325	2325	2310	2350	2350	2350	2310	2250	2400	2400	2410	2400	2404	2350	2350
Feedwater Flow	[illegible]	2360	2360	[illegible]	[illegible]	[illegible]	2280	2000	[illegible]	[illegible]	[illegible]	2300	2275	[illegible]	[illegible]	[illegible]	2300	2240	2330	2340	2330	2330	2370	2300	2300
Condensate Flow	1450	1450	1460	[illegible]	[illegible]	[illegible]	1430	1430	1450	[illegible]	1430	1400	1480	1480	1490	[illegible]	1400	1400	1450	1480	1450	1450	1450	1450	1460
Turbine Backpressure "Hg.	2.50	2.18	2.2	[illegible]	[illegible]	[illegible]	2.60	2.14	2.51	[illegible]	2.66	2.59	2.61	2.64	2.66	2.69	2.7	2.73	3.24	3.23	3.17	3.07	3.04	2.96	2.90
Main Transformer Meter	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5798	6021	[illegible]	[illegible]	6789	7058	7347	7596	7859	8105	8363	8612	[illegible]	9157	9438	9706	9978	0267	0510

RG4LogSheet.xls Sheet("RG-4 CR LOG") Main Control Room Log

0000-0600 [illegible]

0600-1700 DT

1800-2400 CAMERON

NEVADA POWER CO ANY

REID GARDNER STATION UNIT NO. 4
DAILY LOAD DEVIATION LOG

Gross Load

Date: 4/25/2000

TIME	[illegible]	05	06	07	[illegible]	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Max. Obtainable Load	[illegible]	361	290	290	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	490	270	270	301	301	301	301	301	301	301
Disp. Demand	[illegible]	290	290	[illegible]	[illegible]	289	[illegible]	[illegible]	[illegible]	389	250	250	250	298	298	298	298	298	291

* Maximum Load on Unit Due to Coal Limits

REMARKS

0000 4/c P/D unit limited 250 Gross (Cl coal Sealer)
0100
0200
0300
0400
0500
0600
0700
0800
0900
1000
1100
1200
1300
1400
1500 1545 unit limited 250 MW Cl silo emty
1600
1700 1650 unit available (100%) Full Load P/D
1800 2 C P/D
1900
2000
2100
2200 2225 267 MW's DE P/D
2300

COMMENTS

PG4LogSheets.xls Sheet("DEVIATION") Deviation Log [illegible]

0000-0600 [illegible] 0600-1800 DT 1800-2400 Cameron

[illegible]

NEVADA POWER COMPANY

REID GARDNER STATION FGD LOG

DATE: 4/25/00

UNIT 4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Megawatts	284	288	287	[illegible]	[illegible]	[illegible]	283	282	287	287	286	288	286	286	286	286	271	270	263	291	294	294	293	289	284
Scrubber Inlet Te	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	312	310	310	310	310	315	320	320	320	320	320	320	320	325	325	315	325	325	315
"C" Abs. Tray Dif	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.6	4.8	4.8	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.6	4.7	4.6	4.6	4.6	4.7	4.6
Outlet T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	136	136	136	136	136	138	138	138	140	140	140	140	140	140	139	139	139	139	137
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.1	7.1	7.1	7.1	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.1	7.2	7.1	7.1	7.1	7.1	7.1
Inlet Mod Damp.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	83	84	84	84	84	84	84	84	84	84	84	84	83	83	83	83	83	83	83
Slu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1092	093	[illegible]	[illegible]	[illegible]	096	096	096	096	094	094	091	092	091	094	091	092	092	094
"B" Abs. Tray	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
Outlet T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
Inlet Mod Damp. Po	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
Slurry D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]																			
"A" Abs. Tray Dif.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.0	2.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.8	2.8	3.2	3.1	2.8	2.9	2.8	2.5
Outlet T	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	136	136	[illegible]	[illegible]	140	142	142	142	142	142	142	142	142	142	142	141	141	141	138
Slurry D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	70	68	[illegible]	[illegible]	7.0	6.9	6.9	7.0	6.9	7.0	6.9	6.8	7.0	7.2	7.1	7.2	7.1	7.0	7.3
Inlet Mod Damp. Positio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	80	68	80	82	84	84	84	84	84	84	81	80	81	84	84	86	85	83	82
Slurry Densit	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	098	093	100	100	1100	1100	1098	098	1098	098	099	099	092	091	092	095	095	095	093
Plenum Duct Press	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.8	9.8	9.8	9.8	9.9	9.9	9.9	9.8	9.8	9.8	9.9	9.9	9.9	9.9	9.8	9.9	9.9	9.9	9.8
Reheat Steam Flow	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25	23	24	22	22	22	22	22	22	22	21	21	21	22	22	22	22	22	22
Scrubber Outlet Temp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Soda Ash Tank Level	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31	31	31	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Dilute Alkali Density	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1128	1128	1130	1129	1129	1129	1129	1127	1128	1127	1127	1127	1131	1130	1131	1130	1131	1132	1131
Opacity %	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.6	2.7	2.6	2.4	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.4
Nox lbs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.34	.35	.31	.27	.33	.34	.36	.36	.34	.33	.28	.28	.29	.30	.30	.30	.29	.29	.29
So2 Removal Rate %	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	88	87.7	89.1	87	821	87.2	87.1	87.0	87.8	87.4	87.5	87.8	87	87	87	87	87	87	87
N. B/H Inlet Press	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-9.2	-7.9	-9.0	-9.2	-9.1	-9.3	-9.5	-9.8	-9.7	-9.8	-8.4	-8.6	-9.5	-10.3	-10.2	-9.9	-10.2	-10.5	-9.3
S. B/H Inlet Press	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-9.1	-7.1	-8.8	-8.7	-8.8	-8.6	-8.4	-8.2	-8.4	-8.3	-8.0	-8.4	-8.5	-8.7	-9.2	-9.4	-9.3	-9.4	-8.4
N. B/H Sys. Diff. Press	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.3	6.3	7.1	7.2	8.4	8.4	8.6	8.8	8.4	8.5	8.2	8.0	8.0	8.4	8.1	9.0	8.2	8.1	6.4
S. B/H Sys. Diff. Press	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.3	6.6	7.4	7.3	8.3	8.4	7.8	7.3	7.6	7.8	7.7	7.9	7.9	7.2	8.2	8.4	8.3	7.7	5.8

RO4FORMS.XLS RG-4 F&D 1/97 REVISED 5/99

00-05 [signature]

06-17 [signature]

18-24 [signature]

NEVADA POWER COMPANY

Reid Gardner Station — **Powerblock Log 2** — **Date:** 4/25/2000

Unit #4

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	MW Load																									
	#7 Bearing Temp	131	131	131	131	130	130			129	131									137	134	134	134			134
	#3 Bearing Temp	139	139	139	139	139	139			139	138									138	138	138	138			138
	#2 Bearing Temp	132	132	132	131	131	131			130	131									132	132	132	132			132
	Governor Pedestal Oil PSIG	16	16	16	16	16	16			16	16									16	16	16	16			16
	Thrust Bearing Forward Face	142	142	142	142	142	142			141	141									142	142	142	142			142
	Thrust Bearing Rear Face	123	123	123	123	123	123			122	122									122	122	122	122			122
	#1 Bearing Temp	130	130	130	130	130	130			129	130									130	130	130	130			130
	Turning Gear Pedestal Oil PSIG	20	20	20	20	20	20			20	20									20	20	20	20			20
	#4 Bearing Temp	148	148	148	148	147	147			147	146									148	148	148	148			148
	#5 Bearing Temp	144	144	144	144	144	144			143	143									144	144	144	144			144
	#6 Bearing Temp	154	154	154	154	154	154			154	154									154	154	154	154			154
	Machine Gas Press	60	60	60	60	60	60			60	60									60	60	60	60			60
	Generator Vapor Extractor Vacuum	4	4	4	4	4	4			4	4									4	4	4	4			4
	Electro Hydraulic Fluid Level %	55	55	55	55	55	55			55	55									55	55	55	55			55
	Electro Hydraulic Fluid Temp	136	135	134	133	133	132			131	130									136	136	135	135			136
	Turbine Lube Oil Mist Eliminator Diff Press	.5	.5	.5	.5	.5	.5			.5	.5									.5	.5	.5	.5			.5
	Drip Barrel from Gen Vapor Ext.	✓	✓	✓	✓	✓	✓			✓	✓									✓	✓	✓	✓			✓
8.8 - 9.2	Condensate Disch pH	9	9	9	9	9	9			9.0	9.0	8.8														
< 1	CCST Specific Conductvity	.39	.40	.41	.41	.42	.43			.35	.37	.39														
< 1	Condensate Disch Cation Conductivity	.31	.30	.27	.25	.25	.22			.21	.24	.22														
< 1	Boiler Drum Steam Cation Conductivity	.16	.15	.12	.11	.08	.06			.07	.03	.02														
< 10	#4 LP Heater Dissolved O_2																									
< 5	BFP Disch Dissolved O_2																									
	#1 HP Heater Dissolved O_2																									
5.5 - 6.5	CCST pH	5.7	5.7	5.7	5.7	5.7	5.7			5.5	5.5															
< 5	Condensate Disch Specific Conductivity	3	2.7	2.7	2.5	2.7	2.7			2.1	1.8															
< 20	Boiler Drum Water Specific Conductivity	11.1	12.0	12.1	12.3	12.3	12.2			12.3	13.4															
8.4 - 9.4	Boiler Drum Water pH	9.0	9.0	9.0	9.0	9.0	9.0			9.0	9.0															
< 5	Condensate Disch PPB Na+	.19	.19	.19	.19	.19	.19			.19	.19															
< 5	Boiler Drum Steam PPB Na+	.19	.18	.18	.17	.17	.17			.14	.15															
< 10	Condensate Disch Silica	3.2	3.6	4.3	3.7	4.1	4.2			3.9	4.1															
< 100	Boiler Drum Water Silica	.41	.21	.16	.20	.24	.31			.21	.20															
2.4- 3.4	#1 HP Heater Outlet Conductivity	3.1	3.0	2.9	2.9	2.8	2.7			2.4	2.2	2.1														
	Water Panel Room AC Chiller Temp	78	78	78	78	78	77			75	76	79														

{LogSheets.xls Sheet("AO Log Page 2") AO Log Page 2 2/99 (EXCEL)

0000-0500 _____ J-1700 _____ 1800-2400 Salazar

Chain of Custody Records

The following is a listing of the sample and sample identification numbers of all samples analyzed by the Nevada Environmental Laboratory (NEL).

Mercury Testing at Reid Gardner Unit # 4

container ID		Container contents:				date:	
c1r1i	**Done**	Inlet probe filter for run # 1				4/19/2000	D.Ewing
c1r1s	**Done**	Stack probe filter for run # 1				4/19/2000	D.Ewing
c2r1i	**Done**	Inlet probe wash for run # 1				4/19/2000	D.Ewing
c2r1s	**Done**	Stack probe wash for run # 1				4/19/2000	D.Ewing
c3r1i	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 1				4/19/2000	D.Ewing
c3r1s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 1				4/19/2000	D.Ewing
c4r1i	**Done**	Inlet impinger # 4 contents (& rinse) from run #1				4/19/2000	D.Ewing
c4r1s	**Done**	Stack impinger # 4 contents (& rinse) from run #1				4/19/2000	D.Ewing
c5r1i	**Done**	Inlet impingers # 5, 6,7 contents (& rinse) from run # 1				4/19/2000	D.Ewing
c5r1s	**Done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 1				4/19/2000	D.Ewing
c6r1i	**n/a**	Inlet impinger # 8 contents (silica gel) from run # 1				4/19/2000	D.Ewing
c6r1s	**n/a**	Inlet impinger # 8 contents (silica gel) from run # 1				4/19/2000	D.Ewing
c1r2i	**Done**	Inlet probe filter for run # 2				4/20/2000	D. Ewing
c1r2s	**Done**	Stack probe filter for run # 2				4/20/2000	D. Ewing
c2r2i	**Done**	Inlet probe wash for run # 2				4/20/2000	D. Ewing
c2r2s	**Done**	Stack probe wash for run # 2				4/20/2000	D. Ewing
c3r2i	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c3r2s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c4r2i	**Done**	Inlet impinger # 4 contents (& rinse) from run #2				4/20/2000	D. Ewing
c4r2s	**Done**	Stack impinger # 4 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c5r2i	**Done**	Inlet impingers # 5, 6, 7 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c5r2s	**Done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 2				4/20/2000	D. Ewing
c6r2i	**n/a**	Inlet impinger # 8 contents (silica gel) from run # 2				4/20/2000	D. Ewing
c6r2s	**n/a**	Stack impinger # 8 contents (silica gel) from run # 2				4/20/2000	D. Ewing
c1r3i	**Done**	Inlet probe filter for run # 3				4/25/2000	D. Ewing
c1r3s	**Done**	Stack probe filter for run # 3				4/25/2000	D. Ewing
c2r3i	**Done**	Inlet probe wash for run # 3				4/25/2000	D. Ewing
c21r3s	**Done**	Stack probe wash for run # 3				4/25/2000	D. Ewing
c3r3i	**Done**	Inlet impingers # 1, 2, 3 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c3r3s	**Done**	Stack impingers # 1, 2, 3 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c4r3i	**Done**	Inlet impinger # 4 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c4r3s	**Done**	Stack impinger # 4 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c5r3i	**Done**	Inlet impingers # 5, 6, 7 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c5r3s	**Done**	Stack impingers # 5, 6, 7 contents (& rinse) from run # 3				4/25/2000	D. Ewing
c6r3i	**n/a**	Inlet impinger # 8 contents (silica gel) from run # 3				4/25/2000	D. Ewing
c6r3s	**n/a**	Inlet impinger # 8 contents (silica gel) from run # 3				4/25/2000	D. Ewing
c7b1	**Done**	Blank of 50ml of .1N HNO_3				4/19/2000	D.Ewing
c8b1	**Done**	Blank of 50ml of 1N KCl				4/19/2000	D.Ewing
c9b1	**Done**	Blank of 50ml of HNO_3-H_2O_2				4/19/2000	D.Ewing
c10b1	**Done**	Blank of 50ml of H_2SO_4-$KMnO_4$				4/19/2000	D.Ewing
c11b1	**Done**	Blank of 100ml of Hydroxylamine solution				4/19/2000	D.Ewing

c12b1	**Done**	Three blank filters.				4/19/2000	D.Ewing
c13b1	**Done**	Blank of 50ml of HNO_3-H_2O_2				4/20/2000	D. Ewing
c14b1	**Done**	Blank of 50ml of HNO_3-H_2O_2				4/25/2000	D. Ewing

NEL LABORATORIES

Reno • Las Vegas • Boise
Phoenix • So. California

Las Vegas Division • 4208 Arcata Way, Ste. A • Las Vegas, NV 89030
702-657-1010 • Fax: 702-657-1577 • 888-368-3282

CHAIN OF CUSTODY

NEL Work Order: L0002744
1 of 5

Project Name: Mercury Test at RG#4	Project Number: NA
Purchase Order Number:	Sampled By:

Company: Nevada Power Company Attention: Dave Ewing
Address: 6226 West Sahara Ave - LV, NV 89146
Phone Number: (702) 367-5657 Fax Number: 227-2051
Billing Address: Expected ~~Due~~ Date: 5/3

Requested Turnaround: X 5-day ____ 2-day ____ 1-day ____ Other

Time/Date Sampled	Customer Sample Identification	N.E.L. Identification	# of Containers	Matrix (Box #1)	Preservative (Box #2)	Analysis: Hg by 7470A	Remarks
4/19/00	C1R1i	01	1	SD		X	
4/19/00	C1R1S	02	1	SD		X	
4/19/00	~~C2R2i~~ C2R1i	03	1	AQ		X	
4/19/00	C2R1S	04	1	AQ		X	
4/19/00	C3R1i	05	1	AQ		X	
4/19/00	C3R1S	06	1	AQ		X	
4/19/00	C4R1i	07	1	AQ		X	
4/19/00	C4R1S	08	1	AQ		X	
4/19/00	C5R1i	09	1	AQ		X	
4/19/00	C5R1S	10	1	AQ		X	

Custody Seal intact? Y N None Temp. 19°C
Condition when received good

Box #1: DW - Drinking Water; WW - Waste Water; OL - Oil/Organic Liquid; SD - Solid; AQ - Aqueous; A - Air

Box #2: A. HCl; B. HNO_3; C. H_2SO_4; D. NaOH; E. Ice Only; F. Other ____; G. Not Preserved

Relinquished by (Print)	(Signature)	Date/Time	Received by (Print)	(Signature)	Date/Time
1 Dave Ewing	Dave Ewing	4/25/00@1645	T. Smolyi		4-25-00/1645
2					
3					

NEL LABORATORIES

Reno • Las Vegas • Boise
Phoenix • So. California

Las Vegas Division • 4208 Arcata Way, Ste. A • Las Vegas, NV 89030
702-657-1010 • Fax: 702-657-1577 • 888-368-3282

CHAIN OF CUSTODY

NEL Work Order: 10000[illegible]44
2 of 5

Project Name:	Project Number:
Purchase Order Number:	Sampled By:

Company: Nevada Power Co Attention: Dave Ewing
Address: 6226 W. Sahara Ave - LV, NV 89146
Phone Number: (702) 367-5657 Fax Number: 227-2051
Billing Address: Expected Due Date: 5/7

Requested Turnaround: ____ 5-day ____ 2-day ____ 1-day ____ Other

Time/Date Sampled	Customer Sample Identification	N.E.L. Identification	# of Containers	Matrix (Box #1)	Preservative (Box #2)	Analysis: Hg by 7470A	Remarks
4/20/00	C1r2i	11	1	SD		X	
4/20/00	C1r2s	12	1	SD		X	
4/20/00	C2r2i	13	1	AQ		X	
4/20/00	C2r2s	14	1	AQ		X	
4/20/00	C3r2i	15	1	AQ		X	
4/20/00	C3r2s	16	1	AQ		X	
4/20/00	C4r2i	17	1	AQ		X	
4/20/00	C4r2s	18	1	AQ		X	
4/20/00	C5r2i	19	1	AQ		X	
4/20/00	C5r2s	20	1	AQ		X	

Custody Seal intact? Y N None Temp. 19°C
Condition when received good

Box #1: DW - Drinking Water; WW - Waste Water; OL - Oil/Organic Liquid; SD - Solid; AQ - Aqueous; A - Air

Box #2: A. HCl; B. HNO_3; C. H_2SO_4; D. NaOH; E. Ice Only; F. Other_____; G. Not Preserved

Relinquished by (Print)	(Signature)	Date/Time	Received by (Print)	(Signature)	Date/Time
1 Dave Ewing	Dave Ewing	4/25/00@16:45	T. Sandoval		4-25-00/1645
2					
3					

NEL LABORATORIES

Reno • Las Vegas • Boise
Phoenix • So. California

Las Vegas Division • 4208 Arcata Way, Ste. A • Las Vegas, NV 89030
702-657-1010 • Fax: 702-657-1577 • 888-368-3282

CHAIN OF CUSTODY

NEL Work Order: L000(illegible)44
3 OF 5

Project Name:	Project Number:
Purchase Order Number:	Sampled By:

Company: Attention:

Address:

Phone Number: Fax Number:

Billing Address: Expected Due Date: 5/3

Requested Turnaround: ____ 5-day ____ 2-day ____ 1-day ____ Other

Time/Date Sampled	Customer Sample Identification	N.E.L. Identification	# of Containers	Matrix (Box #1)	Preservative (Box #2)	Analysis: Hg by 7470A	Remarks
4/20/00	~~C5r2i~~	~~21~~	~~1~~	~~AQ~~		~~X~~	SAMPLES ENTERED ON
4/20/00	~~C5r2s~~	~~22~~	~~1~~	~~AQ~~		~~X~~	C.O.C. TWICE, SEE PAGE
4/25/00	C1r3i	23	1	AQ		X	2 OF 5. ME 4/26/00
4/25/00	C1r3s	24	1	AQ		X	
4/25/00	C2r3i	25	1	AQ		X	
4/25/00	C2r3s	26	1	AQ		X	
4/25/00	C3r3i	27	1	AQ		X	
4/25/00	C3r3is	28	1	AQ		X	

Custody Seal intact? Y N None Temp. 19°C

Condition when received good

Box #1		
	DW - Drinking Water	SD - Solid
	WW - Waste Water	AQ - Aqueous
	OL - Oil/Organic Liquid	A - Air

Box #2		
	A. HCl	E. Ice Only
	B. HNO_3	F. Other_____
	C. H_2SO_4	G. Not Preserved
	D. NaOH	

	Relinquished by (Print)	(Signature)	Date/Time	Received by (Print)	(Signature)	Date/Time
1	Dave Ewing	Dave Ewing	4/25/00 @ 16:45	T. Saavedra	T. Saavedra	1645 4-25-00
2						
3						

NEL LABORATORIES

Reno • Las Vegas • Boise
Phoenix • So. California

Las Vegas Division • 4208 Arcata Way, Ste. A • Las Vegas, NV 89030
702-657-1010 • Fax: 702-657-1577 • 888-368-3282

CHAIN OF CUSTODY

NEL Work Order: 10000744

4 of 5

Project Name:	Project Number:
Purchase Order Number:	Sampled By:

Company: Attention:

Address:

Phone Number: Fax Number:

Billing Address: Expected Due Date: 5/3

Requested Turnaround: ____ 5-day ____ 2-day ____ 1-day ____ Other

Time/Date Sampled	Customer Sample Identification	N.E.L. Identification	# of Containers	Matrix (Box #1)	Preservative (Box #2)	Analysis: Hg by 7470A	Remarks
4/25/00	C4 r3i	29	1	AQ		X	
4/25/00	C4 r3s	30	1	AQ		X	
4/25/00	C5 r3i	31	1	AQ		X	
4/25/00	C5 r3s	32	1	AQ		X	
~~4/25/00~~	~~C6 r3i~~	~~33~~	~~1~~	~~AQ~~		~~X~~	SAMPLES NOT RECEIVED
4/25/00	C6 r3s	34	1	AQ		X	" " " 4/26/00
4/19/00	C7 b1	35	1	AQ		X	0.1N HNO_3
4/19/00	C8 b1	36	1	AQ		X	1N KCl
4/19/00	C9 b1	37	1	AQ		X	HNO_3-H_2O_2
4/19/00	C10 b1	38	1	AQ		X	H_2SO_4-$KMnO_4$

Custody Seal intact? Y N None Temp. 19°C

Condition when received good

Box #1: DW - Drinking Water; WW - Waste Water; OL - Oil/Organic Liquid; SD - Solid; AQ - Aqueous; A - Air

Box #2: A. HCl; B. HNO_3; C. H_2SO_4; D. NaOH; E. Ice Only; F. Other ____; G. Not Preserved

Relinquished by (Print)	(Signature)	Date/Time	Received by (Print)	(Signature)	Date/Time
1 Dave Ewing	Dave Ewing	4/25/00@1646	T. Sandoval		4-25-00/1646
2					
3					

NEL LABORATORIES

Reno • Las Vegas • Boise
Phoenix • So. California

Las Vegas Division • 4208 Arcata Way, Ste. A • Las Vegas, NV 89030
702-657-1010 • Fax: 702-657-1577 • 888-368-3282

CHAIN OF CUSTODY

NEL Work Order: _____

Project Name:	Project Number:
Purchase Order Number:	Sampled By:

Company: NEVADA Attention:

Address:

Phone Number: Fax Number:

Billing Address: Expected Due Date: 5/3

Requested Turnaround: ____ 5-day ____ 2-day ____ 1-day ____ Other

Time/Date Sampled	Customer Sample Identification	N.E.L. Identification	# of Containers	Matrix (Box #1)	Preservative (Box #2)	Analysis: Hg by 7470A	Remarks
4/19/00	C11b1	39	1	AQ		X	Hydroxylamine Solution
4/19/00	C12b1	40	3	SD		X	Blank Filters
4/20/00	C13b1	41	1	AQ		X	HNO_3-H_2O_2
4/25/00	C14b1	42	1	AQ		X	HNO_3-H_2O_2

Custody Seal intact? Y N (None) Temp. 19°C

Condition when received (good)

Box #1		
	DW - Drinking Water	SD - Solid
	WW - Waste Water	AQ - Aqueous
	OL - Oil/Organic Liquid	A - Air

Box #2		
	A. HCl	E. Ice Only
	B. HNO_3	F. Other_____
	C. H_2SO_4	G. Not Preserved
	D. NaOH	

	Relinquished by (Print)	(Signature)	Date/Time	Received by (Print)	(Signature)	Date/Time
1	Dave Ewing	Dave Ewing	4/25/00 @ 16:46	T. Sandico		4-25-00 / 1646
2						
3						

APPENDIX-D

ANALYTICAL LAB RECORDS

Coal Analysis
NEL Laboratory Analytical Results

Coal (Fuel) Analysis

Dave Ewing
NEVADA POWER COMPANY
6226 W. SAHARA AVE.

LAS VEGAS,NV 89151

June 2, 2000
REQUEST NUMBER: 17158
LAB NUMBER: G7970
SAMPLE ID:

RG4R2A

REPORT OF ANALYSIS

	AS RECEIVED wt.%	MOISTURE FREE wt.%	MOISTURE & ASH FREE wt.%
PROXIMATE:			
MOISTURE	10.75		
ASH	8.67	9.72	
VOLATILE MATTER	33.01	36.98	40.96
FIXED CARBON	47.57	53.30	59.04
TOTAL	100.00	100.00	100.00
HEATING VALUE (Btu/lb.)	11,153	12,496	13,841
ULTIMATE:			
MOISTURE	10.75		
HYDROGEN	3.46	3.88	4.30
CARBON	64.80	72.61	80.43
NITROGEN	1.02	1.14	1.26
SULFUR	0.65	0.73	0.81
OXYGEN	10.65	11.93	13.21
ASH	8.67	9.72	
TOTAL	100.00	100.00	100.00

Hydrogen and oxygen values reported do not include hydrogen and oxygen in the free moisture associated with the sample.

Monte L. Ellis
Laboratory Manager

MLE:tab

WYOMING ANALYTICAL LABORATORIES, INC.

1660 Harrison St.
Laramie, WY 82070

wallaramie@aol.com

(307) 742-7995
Fax: (307) 721-8956

MEMBER ACIL

Dave Ewing
NEVADA POWER COMPANY
6226 W. SAHARA AVE.

LAS VEGAS,NV 89151

June 2, 2000
REQUEST NUMBER: 17158
LAB NUMBER: G7971
SAMPLE ID:

RG4R3A

REPORT OF ANALYSIS

	AS RECEIVED wt.%	MOISTURE FREE wt.%	MOISTURE & ASH FREE wt.%
PROXIMATE:			
MOISTURE	10.33		
ASH	8.38	9.34	
VOLATILE MATTER	33.61	37.48	41.34
FIXED CARBON	47.68	53.18	58.66
TOTAL	100.00	100.00	100.00
HEATING VALUE (Btu/lb.)	11,280	12,579	13,875
ULTIMATE:			
MOISTURE	10.33		
HYDROGEN	3.50	3.90	4.30
CARBON	65.68	73.24	80.79
NITROGEN	0.97	1.08	1.19
SULFUR	0.38	0.42	0.46
OXYGEN	10.76	12.00	13.24
ASH	8.38	9.34	
TOTAL	100.00	100.00	100.00

Hydrogen and oxygen values reported do not include hydrogen and oxygen in the free moisture associated with the sample.

Monte L. Ellis
Laboratory Manager

MLE:tab

WYOMING ANALYTICAL LABORATORIES, INC.

1660 Harrison St.
Laramie, WY 82070

wallaramie@aol.com

(307) 742-7995
Fax: (307) 721-8956

MEMBER ACIL

Dave Ewing
Nevada Power Company

Date: May 31, 2000
Request Number: 17158

REPORT OF ANALYSIS

Lab Number:	Sample ID:	Mercury, mg/kg	Chlorine, mg/kg
G7969	RG4R1A	0.07	152
G7970	RG4R2A	0.05	105
G7971	RG4R3A	0.06	115

Compound	Standard	Method	Sample Prep.
Mercury	Nist 1630A	D-3684	D-2013
Hg Secondary	SARM20	D-3684	D-2013
Chloride	Nist 1630A	D-4208	D-2013
Cl Secondary	SRM AR1910	D-4208	D-2013
Cl Secondary	SRM AR1911	D-4208	D-2013

Monte L. Ellis
Laboratory Manager

MLE:tab

WYOMING ANALYTICAL LABORATORIES, INC.

1660 Harrison St.
Laramie, WY 82070

wallaramie@aol.com

(307) 742-7995
Fax: (307) 721-8956

MEMBER ACIL

NEL Laboratory Analytical Results

NEL LABORATORIES
Reno • Las Vegas
Phoenix • So. California

Las Vegas Division
4208 Arcata Way, Suite A • Las Vegas, NV 89030
(702) 657-1010 • Fax: (702) 657-1577
1-888-368-3282

CLIENT: Nevada Power Company
P.O. Box 230 MS30
Las Vegas, NV 89151
ATTN: Dave Ewing

PROJECT NAME: Mercury Test at RG#4
PROJECT NUMBER: NA

NEL ORDER ID: L0004244

Attached are the analytical results for samples in support of the above referenced project.

Samples submitted for this project were not sampled by NEL Laboratories. Samples were received by NEL in good condition, under chain of custody on 4/25/00.

Should you have any questions or comments, please feel free to contact our Client Services department at (702) 657-1010.

Stan Van Wagenen
Laboratory Manager

5/3/00
Date

CERTIFICATIONS:

	Reno	Las Vegas	S. California
Arizona	AZ0520	AZ0518	AZ0605
California	1707	2002	2264
US Army Corps of Engineers	Certified	Certified	

	Reno	Las Vegas	S. California
Idaho	Certified	Certified	
Montana	Certified	Certified	
Nevada	NV033	NV052	CA084
L.A.C.S.D.			10228

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C1r1i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-01
TEST:	**Metals**		
MATRIX:	Solid	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.020	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C1r1s**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-02

TEST: **Metals**
MATRIX: Solid

ANALYST: JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C2r1i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-03
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C2r1s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-04
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C3r1i**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-05

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C3r1s**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-06

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C4r1i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-07
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C4r1s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-08
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C5r1i**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-09

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00048	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C5r1s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-10
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00035	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**
MATRIX: Solid

CLIENT ID: **C1r2i**
DATE SAMPLED: 4/20/00
NEL SAMPLE ID: L0004244-11
ANALYST: JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.041	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C1r2s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-12
TEST:	**Metals**		
MATRIX:	Solid	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C2r2i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-13
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C2r2s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-14
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C3r2i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-15
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00022	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C3r2s**
DATE SAMPLED: 4/20/00
NEL SAMPLE ID: L0004244-16

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C4r2i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-17
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C4r2s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/20/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-18
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**
MATRIX: Aqueous

CLIENT ID: **C5r2i**
DATE SAMPLED: 4/20/00
NEL SAMPLE ID: L0004244-19
ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00073	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C5r2s**
DATE SAMPLED: 4/20/00
NEL SAMPLE ID: L0004244-20

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00055	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**
MATRIX: Solid

CLIENT ID: **C1r3i**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-23
ANALYST: JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C1r3s**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-24

TEST: **Metals**
MATRIX: Solid

ANALYST: JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C2r3i**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-25

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C2r3s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/25/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-26
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C3r3i**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-27

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**
MATRIX: Aqueous

CLIENT ID: **C3r3s**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-28
ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00026	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
P' 'ECT #: NA

CLIENT ID: **C4r3i**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-29

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C4r3s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/25/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-30
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C5r3i**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/25/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-31
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C5r3s**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/25/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-32
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00034	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C7b1**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-35
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C8b1**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-36
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00029	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C9b1**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-37

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C10b1**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-38
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00021	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

- Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT:	Nevada Power Company	CLIENT ID:	**C11b1**
PROJECT ID:	Mercury Test at RG#4	DATE SAMPLED:	4/19/00
PROJECT #:	NA	NEL SAMPLE ID:	L0004244-39
TEST:	**Metals**		
MATRIX:	Aqueous	ANALYST:	JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	0.00021	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C12b1**
DATE SAMPLED: 4/19/00
NEL SAMPLE ID: L0004244-40

TEST: **Metals**
MATRIX: Solid

ANALYST: JY - Reno Division

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
P[illegible]JECT #: NA

CLIENT ID: **C13b1**
DATE SAMPLED: 4/20/00
NEL SAMPLE ID: L0004244-41

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA

CLIENT ID: **C14b1**
DATE SAMPLED: 4/25/00
NEL SAMPLE ID: L0004244-42

TEST: **Metals**
MATRIX: Aqueous

ANALYST: JY - Reno Division

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D. F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**

CLIENT ID: **Method Blank**
DATE SAMPLED: NA
NEL SAMPLE ID: L04244-40-Hg-BLK

PARAMETER	RESULT mg	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.00002 mg	0.1	EPA 7471A	5/2/00	5/2/00

D.F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**

CLIENT ID: **Method Blank**
DATE SAMPLED: NA
NEL SAMPLE ID: L04244-Hg-03-BLK

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D.F. - Dilution Factor

ND - Not Detected

NEL LABORATORIES

CLIENT: Nevada Power Company
PROJECT ID: Mercury Test at RG#4
PROJECT #: NA
TEST: **Metals**

CLIENT ID: **Method Blank**
DATE SAMPLED: NA
NEL SAMPLE ID: L04244-Hg-27-BLK

PARAMETER	RESULT mg/L	REPORTING LIMIT	D. F.	METHOD	DIGESTED	ANALYZED
Mercury	ND	0.0002 mg/L	1	EPA 7470A	5/1/00	5/1/00

D.F. - Dilution Factor

ND - Not Detected

APPENDIX-E

AUDIT DATA SHEETS

APPENDIX-F

LIST OF PARTICIANTS

Test Site Organization

The key tasks and task leaders were:

Responsible people and organizations for this project were:

Test site operator: Nevada Power Company,
Reid Gardner Station.
P.O. Box 77, Moapa, NV 89105
Telephone: (702) 367-5900

Test site Responsible Official:
Mark J. Sandoval
Director, Reid Gardner Station
P.O. Box #230 M/S 77
Las Vegas NV 89151
Telephone: (702) 367-5900, Ext.201
Fax: (702) 367-5885

Test program manager:
Dave Ewing
Test Director
NPC Environmental Services Department
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5657
Cellular: (702) 277-4924
Fax: (702) 227-2051

Plant Operations Officer:
Jeff Robb
Plant Environmental Engineer (Reid Gardner)
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5900, Ext. 305
Fax: (702) 367-5885

Methods Auditor:
Chris Heintz
Plant Environmental Engineer (Clark, Sunrise, Harry Allen)
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 434-7111
Fax: (702) 434-7730

Site Chemist: On duty Sample Lab people
NPC Reid Gardner Station.
P.O. Box #230 M/S 30
Las Vegas, NV 89151
Telephone: (702) 367-5900, Ext. 406
Fax: (702) 367-5885

Safety Officer: Carol Madril
Plant Safety Consultant (All Generation Plants)
P.O. Box #230 M/S 77
Las Vegas, NV 89151
Telephone: (702) 434-7111
Fax: (702) 434-7730

Sample analysis: (Contractor Laboratory Team:)

Nevada Environmental Laboratory (NEL):
Stanley VanWagenen (and staff)
NEL Division Manager
4208 Arcadia Way, Las Vegas NV 89030
(702) 657-1010

Table 5-1
Test Personnel and Responsibilities

Staff Assignment	Responsibilities
1. Test Director: Dave Ewing	Coordinated all test activities. Maintained communication between all test participants. Collected process data. Collected and coordinated coal sampling. Maintained custody of data sheets and reduced data. Assisted in other activities as required.
2. Project Chemist/Sample Custodian Water Lab Staff	Coordinated and perform all sample train loading and recovery activities. Maintained sample custody records. Assist in other activities as required.
3. Stack Sampling Team Leader Dave Ewing	Prepared and operated Ontario Hydro train at stack. Recorded and reduced data. Assisted in sample recovery and other activities as required.
4. Stack Sampling Assistant Deny Rasmuson	Assisted in preparation and operation of Ontario Hydro train at stack. Assisted in sample recovery and other activities as required.
5. Inlet Sampling Team Leader Deny Rassmusen	Prepare and operate Ontario Hydro train at inlet. Record and reduce data. Assist in sample recovery and other activities as required.
6. Outlet Sampling Team Leader Chris Heintz	Prepare and operate Ontario Hydro train at outlet. Record and reduce data. Assist in sample recovery and other activities as required.
7. Outlet Sampling Helper Jeff Robb	Prepare and operate Ontario Hydro train at outlet. Record and reduce data. Assist in sample recovery and other activities as required.
8. Safety Officer Carol Madril	Insure all participants maintain a safe work schedule and procedures.

APPENDIX-G

ADDITIONAL INFORMATION

Letter of Certification
RG-4 Operating Permit (#1930)
Ontario Method

Letter of Certification

Nevada Power℠

June 9, 2000

Mr. William Grimley
United States Environmental Protection Agency (USEPA)
Emission Measurement Center (MD-19)
Research Triangle Park (RTP)
North Carolina 27711

RE: Reid Gardner Unit-4 Final Test Report
EPA Mercury Information Request

You will find attached six bound copies and one un-bound copy of the Ontario Hydro Method (October 21, 1999) mercury testing conducted on Nevada Power Company's (NPC) Reid Gardner Station Unit # 4 (RG-4) coal fired generating unit.

The purpose of this submittal is to provide EPA with speciated mercury emissions data at the stack of RG-4. This data is intended to assist EPA in developing emission factors for boilers of this class.

NPC's Environmental staff conducted the "Standard Test Method for Elemental , Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fird Stationary Sources" (a.k.a. "Ontario Hydro Method") on April 19, 20 and 24, 2000.

Should you have any questions, comments or concerns on this matter please contact David Ewing at his office (702) 367-5657 or at his cellular (702) 277-4924.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name: Dennis J. Schwehr, Environmental Services
Designated Representative - Nevada Power Company

Signature: Dennis J Schwehr Date: 6-9-2000

cc: Mr. William Maxwell (USEPA)
Jeff Robb (MS/77)
file: DR file.

d:\ewing\intest\test2000\HgdrLtr2000.doc

RG-4 Boiler Operating Permit # 1930

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY
123 WEST NYE LANE
CARSON CITY, NEVADA 89710

NO. 1930

AIR QUALITY OPERATING PERMIT OCA # 272

Issued to: NEVADA POWER COMPANY
P.O. BOX 230, LAS VEGAS, NEVADA 89151
Location: SECTION 5, T15S, R66E, MDB&M (HA 218

is granted a permit to operate the following source of air contaminant:

Unit #4 - Foster Wheeler Boiler, custom design, with a gross generating capacity of approximately 295 megawatts and a net capacity of approximately 265 megawatts,

which shall operate in compliance with Nevada Administrative Code (NAC) 445.430 through 445.846.

Restrictions:

1. Facilities Operation

All equipment, facilities, and systems installed or used to achieve compliance with the terms and conditions of the Operating Permit shall at all times be maintained in good working order and be operated as efficiently as possible so as to minimize air pollutant emissions.

Excess Emissions

The Bureau of Air Quality shall be notified by telephone within 24 hours following any failure of air pollution control equipment, process equipment, or of a process, to operate in a normal manner which results in an increase in emissions above any allowable emissions limit stated in the operating permit restrictions. In addition, the Bureau of Air Quality shall be notified in writing within fifteen (15) days of any such failure. This notification shall include a description of the malfunctioning equipment or abnormal operation, the date of the initial failure, the period of time over which emissions were increased due to the failure, the cause of the failure, the estimated resultant emissions in excess of those allowed under the Operating Permit, and the methods utilized to restore normal operations. Compliance with this malfunction notification provision shall not excuse or otherwise constitute a defense to any violations of this permit or of any law or regulations which such malfunction may cause.

3. Right to Entry

The Bureau of Air Quality staff, upon the presentation of credentials, shall be permitted at any time:

A. to enter upon the premises where the source is located or in which any records are required to be kept under the terms and conditions of the Operating Permit;

B. to have access to and copy any records required to be kept under the terms and conditions of the Operating Permit;

C. to inspect any equipment, operation, or method required in the Operating Permit;

D. to sample emissions from the source or other process materials and conditions.

4. Severability

The provisions of the Operating Permit are severable, and if any provision of the Operating Permit is held invalid, the remainder of the Operating Permit shall not be affected thereby.

5. Other Applicable Regulations

The owner or operator of the facility shall operate in compliance with all other applicable provisions of 40 CFR Parts 60 and 61 and Nevada Administrative Code 445.430 through 445.846.

NO. 1930

AIR QUALITY OPERATING PERMIT

Issued to: NEVADA POWER COMPANY
P.O. BOX 230, LAS VEGAS, NEVADA 89151
Location: SECTION 5, T15S, R66E, MDB&M (HA 218)

Restrictions Continued:

2. On and after the startup of Unit No. 4, Nevada Power Company shall not discharge or cause the discharge into the atmosphere from Unit Nos. 1-3 sulfur emissions in excess of 0.275 lb/10^6 Btu, in accordance with Nevada Administrative Code 445.748.

E. Continuous Monitoring

1. Nevada Power Company shall continuously monitor emissions from Unit No. 4 as specified in 40 CFR 60.47a and Subpart A. Nevada Power Company shall maintain records of all emission measurements, all monitor equipment calibrations, and all adjustments and maintenance performed on these monitors in accordance with 40 CFR 60.47a and Subpart A. These records shall be in permanent form suitable for inspection. Such records shall be retained for at least two years following the date of such measurements, maintenance reports and records.

2. Nevada Power Company shall develop and maintain a quality assurance plan in accordance with 40 CFR 60, Appendix F.

3. a. Nevada Power Company shall, in accordance with 40 CFR 60.49a and Subpart A, submit a written report of excess emissions and monitor information for Unit No. 4 to the Bureau of Air Quality, for every calendar quarter. The report shall also include excess emissions from Units 1, 2, and 3 and their monitor information shall be reported in accordance with Nevada Administrative Code 445.692 for Units 1 and 2, and 40 CFR 60, Subpart D for Unit #3.

b. A summary of excess emissions and monitor down time shall be submitted to the Bureau of Air Quality with each quarterly report. Nevada Power Company shall use the "Quarterly Emission Report Form" provided by the Bureau of Air Quality.

4. Upon the occurrence of an excess emission from Units 1, 2, or 3, Nevada Power Company shall report the incident to the Bureau of Air Quality in accordance with Nevada Administrative Code 445.667.

F. Coal Sampling

1. Coal shall be sampled before entering the boiler for moisture, ash, sulfur content, and gross calorific value. A coal analysis shall be performed weekly and the results of these analyses shall be retained for at lest two years following the date of measurement. All sample collection, sample preparation, and analyses performed or caused to be performed shall be conducted according to the most current ASTM methods.

2. Coal analysis during performance tests shall be ultimate analysis.

G. Ambient Monitoring

1. The existing 100 meter meteorological tower identified as BMT must be operated for the life of the operating permit for Unit 4 in accordance with the Nevada Bureau of Air Quality Ambient Air Quality Monitoring Guidelines (Attachment A).

2. The ambient air must be monitored for total suspended particulate (TSP), particulate matter <10 microns (PM_{10}) and sulfur dioxide (SO_2) in at least two locations for the life of the operating permit for Unit 4 in accordance with the Nevada Bureau of Air Quality Ambient Air Quality Monitoring Guidelines (Attachment A).

3. At one of the locations mentioned in F.2. above the ambient air must be monitored for all criteria pollutants (except carbon monoxide and lead), wind speed, wind direction and ambient temperature for the life of the operating permit for Unit 4 in accordance with the Nevada Bureau of Air Quality Ambient Air Quality Monitoring Guidelines (Attachment A).

ONTARIO TEST METHOD
October 21, 1999

This test method is under the jurisdiction of ASTM Committee D-22 on Sampling and [1] Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

Annual Book of ASTM Standards, Vol. 11.01. [2]

October 21, 1999

Standard Test Method for Elemental, Oxidized, Particle-Bound, and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method) [1]

1. Scope

1.1 This method applies to the determination of elemental, oxidized, particle-bound, and total mercury emissions from coal-fired stationary sources.

1.2 This method is applicable to elemental, oxidized, particle-bound, and total mercury concentrations ranging from approximately 0.5 to 100 µg/dscm.

1.3 This method describes equipment and procedures for obtaining samples from effluent ducts and stacks, equipment and procedures for laboratory analysis, and procedures for calculating results.

1.4 This method is applicable for sampling elemental, oxidized, and particle-bound mercury at the inlet and outlet of emission control devices and for calculating control device mercury collection efficiency.

1.5 Method applicability is limited to flue gas stream temperatures within the thermal stability range of the sampling probe and filter components.

1.6 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.7 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.8 This standard assumes users are familiar with EPA stack-gas sampling procedures as stated in EPA Methods 1– 4, Method 5, and Method 17.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1193 Specification for Reagent Water [2] **DRAFT**

Annual Book of ASTM Standards, Vol. 11.03. [3]

Annual Book of ASTM Standards, Vol 14.02. [4]

Available from the U.S. Environmental Protection Agency's Emission Measurement [5] Technical Information Center or Code of Federal Regulations (40 CFR Part 60, Appendix A or 40 CFR Part 61, Appendix B).

D1356 Definitions of Terms Relating to Atmospheric Sampling and Analysis [3]

D 2986 Evaluation of Air-Assay Media by the Monodisperse DOP (Dioctyl Phthalate) Smoke Test [3]

D 3154 Test Method for Average Velocity in a Duct (Pitot Tube Method)[3]

D 3685 Particulates Independently or for Particulates and Collected Residue Simultaneously in Stack Gases [3]

E 1 Specification for ASTM Thermometers [4]

2.2 *Other Standards:*[5]

EPA Method 1 – Sample and Velocity Traverses for Stationary Sources

EPA Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
EPA Method 3 – Gas Analysis for the Determination of Dry Molecular Weight
EPA Method 4 – Determination of Moisture Content in Stack Gases
EPA Method 5 – Determination of Particulate Emissions from Stationary Sources
EPA Method 12 – Determination of Inorganic Lead Emissions from Stationary Sources
EPA Method 17– Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)
EPA Method 29 – Determination of Metals Emissions from Stationary Sources
EPA Method 101A – Determination of Particle-Bound and Gaseous Mercury Emissions from Sewage Sludge Incinerators
EPA Method 301 – Field Validation of Pollutant Measurement Methods from Various Waste Media
EPA SW 846 7470 – Mercury in Liquid Waste – Manual Cold Vapor Technique
EPA Water and Waste 600/4-79-020 – Methods for Chemical Analysis of Water and Wastes

3. Terminology

3.1 Definitions other than those given below in Sections 3.2, 3.3, and 3.4 are listed in ASTM D 1356.

3.2 *Definitions of Terms specific to the standard*:

3.2.1 *elemental mercury*— mercury in its zero oxidation state, Hg .

3.2.2 *oxidized mercury*— mercury in its mercurous or mercuric oxidation states: Hg_2^{2+} and Hg, respectively.

3.2.3 *elemental mercury catch*— mercury collected in the acidified hydrogen peroxide (HNO –H O) and potassium permanganate (H SO –KMnO) impinger solutions employed in this method. This is gaseous Hg^0.

3.2.4 *oxidized mercury* catch— mercury collected in the aqueous potassium chloride (KCl) impinger solution employed in this method. This is gaseous Hg^{2+}.

3.2.5 *particle-bound mercury catch*— mercury associated with the particulate matter collected in the front half of the sampling train.

3.2.6 *sample train*— complete setup including nozzle, probe, probe liner, filter, filter holder, impingers, and connectors.

3.2.7 *Impinger train*— setup includes only the impingers and connectors.

3.2.8 *front half of the sampling train*— all mercury collected on and upstream of the sample filter.

3.2.9 *total mercury*— all mercury (solid-bound, liquid, or gaseous) however generated or entrained in the flue gas stream (i.e., summation of elemental, oxidized, and particle-bound mercury).

3.3 *Symbols*:

A = cross-sectional area of stack, m (ft)

B = water vapor in the gas stream, proportion by volume $_{ws}$

þH = average pressure differential across the orifice meter, kPa (in. H O) $_2$

Hg = concentration of mercury in sample filter ash, µg/g $_{ash}$

Hg = concentration of particle-bound mercury, µg/dscm $_{tp}$

Hg = concentration of elemental mercury, µg/dscm $_0$

Hg = concentration of oxidized mercury, µg/dscm $_{2+}$

IR = instrument reading from mercury analyzer, µg/L
L = leakage rate observed during the posttest leak check, m /min (cfm)
L = maximum acceptable leakage rate $_a$
M = molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole) $_s$
M = molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole) $_w$
N = Normal conditions, defined as 0° C and 1 atmosphere pressure (in the U.S. N and standard conditions are the same in SI units)
P = barometric pressure at the sampling site, kPa (in. Hg) $_{bar}$
P = absolute stack gas pressure, kPa (in. Hg) $_s$
P = standard absolute pressure, 101.3 kPa (29.92 in. Hg) $_{std}$
R = ideal gas constant, 0.008314 kPa-m /K-g-mole (21.85 in. Hg-ft /þR-lb-mole) $_{3\ 3}$
T = absolute average dry gas meter temperature, K (þR) $_m$
T = absolute stack temperature, K (þR) $_s$
T = standard absolute temperature, 293 K (528þR) $_{std}$
V = total digested volume, mL $_D$
V = volume of gas sample as measured by dry gas meter, dcm (dscf) $_m$
V = volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf)
V = volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)
W = total mass of ash on sample filter, g $_{ash}$
W = total mass of liquid collected in impingers and silica gel, g (lb) $_{lc}$
Y = dry gas meter calibration factor
þ = total sampling time, min
þ = sampling time interval, from the beginning of a run until the first component change, min

4. Summary of Test Method

4.1 A sample is withdrawn from the flue gas stream isokinetically through a probe/filter system, maintained at 120þC or the flue gas temperature, whichever is greater, followed by a series of impingers in an ice bath. Particle-bound mercury is collected in the front half of the sampling train. Oxidized mercury is collected in impingers containing a chilled aqueous potassium chloride solution. Elemental mercury is collected in subsequent impingers (one impinger
containing a chilled aqueous acidic solution of hydrogen peroxide and three impingers containing chilled aqueous acidic solutions of potassium permanganate). Samples are recovered, digested, and then analyzed for mercury using cold-vapor atomic absorption (CVAAS) or fluorescence spectroscopy (CVAFS).

5. Significance and Use

5.1 The measurement of particle-bound, oxidized, elemental, and total mercury in stationary-source flue gases provides data that can be used for dispersion modeling, deposition evaluation, human health and environmental impact assessments, emission reporting, compliance determinations, etc. Particle-bound, oxidized, and elemental mercury measurements before and after control devices may be necessary for optimizing and evaluating the mercury removal efficiency of emission control technologies.

6. Interferences

There are no known interferences, but certain biases may be encountered (See Section 16).

7. Apparatus

7.1 *Sampling Train*— similar to ASTM D 3685, EPA Method 5/EPA Method 17 and

EPA Method 29 trains, as illustrated in Fig. 1.

7.1.1 *Probe Nozzle (Probe Tip)*— Glass nozzles are required unless alternate nozzles are constructed of materials that are free from contamination and will not interact with the sample. Probe fittings constructed of polytetrafluoroethylene (PTFE), polypropylene, etc., are required instead of metal fittings to prevent contamination.

7.1.2. *Probe Liner*— If the sample train is to be in EPA Method 5 configuration (out-of-stack filtration), the probe liner must be constructed of quartz or borosilicate glass. If an EPA Method 17 (in-stack filtration) sampling configuration is used, the probe/probe liner may be constructed of borosilicate glass, quartz or, depending on the flue gas temperature, PTFE.

7.1.3 *Pitot Tube*— Type S pitot tube. Refer to Section 2.2 of EPA Method 2 for a description.

7.1.4 *Differential Pressure Gauges*— inclined manometers or equivalent devices. Refer to Section 2.1 of EPA Method 2 for a description.

7.1.5 *Filter Holder* — constructed of borosilicate glass or PTFE-coated stainless steel with a PTFE filter support or other nonmetallic, noncontaminating support. Do not use a glass frit or stainless steel wire screen. A silicone rubber or PTFE gasket, designed to provide a positive seal against leakage from outside or around the filter, may be used.

7.1.6 *Connecting Umbilical Tube*— heated PTFE tubing. This tube must be heated to a minimum of 120° C to help prevent water and acid condensation. (The umbilical tube is defined as any tubing longer than 0.5 m that connects the filter holder to the impinger train).

7.1.7 *Probe and Filter Heating System*

7.1.7.1 *EPA Method 5 Configuration*— For EPA Method 5 configuration, the temperature of the flue gas, sample probe, and the exit of the sample filter must be monitored using temperature sensors capable of measuring temperature to within 3þC (5.4þF). The heating system must be capable of maintaining the sample gas temperature of the probe and exit of the sample filter to within ±15þC (± 27þF) of the flue gas temperature. Regardless of the flue gas temperature, to prevent water and acid condensation, at no time must the probe temperature, sample filter exit gas temperature, or the temperature of the connecting umbilical cord be less than 120° C.

7.1.7.2 *EPA Method 17 Configuration*— For EPA Method 17 configuration, the sample filter is located in the duct and, therefore, naturally maintained at the flue gas temperature. The heating system is only required to maintain the probe and connecting umbilical cord to at least 120° C. If the flue gas temperature is less than 120° C, then EPA Method 5 configuration must be used.

7.1.8 *Condensing/Absorbing System*— consists of eight impingers immersed in an ice bath and connected in series with leak-free ground glass fittings or other noncontaminating leak-free fittings. (At no time is silicon grease or other greases to be used for this method). The first, second, fourth, fifth, sixth, and eighth impingers are of the Greenburg– Smith design modified by replacing the standard tip with a 1.3-cm (0.5-in.)-ID straight glass tube extending to about 1.3 cm (0.5 in.) from the bottom of the flask. The third and seventh impingers are also Greenburg–Smith design, but with the standard tip including the glass impinging plate. The first, second, and third impingers contain aqueous 1 N potassium chloride (KCl) solution. The fourth impinger contains an aqueous solution of 5% / nitric acid (HNO) and 10% / hydrogen peroxide (H O). The fifth, sixth, and seventh impingers contain an aqueous solution of 4% / potassium permanganate (KMnO) and 10% / sulfuric acid (H SO). The last impinger contains silica gel or an equivalent desiccant. Refer to Note 1.

Note 1— When flue gas streams are sampled with high moisture content (>20%), additional steps
must be taken to eliminate carryover of impinger contents from one sample type to the next. These steps must include use of oversized impinger(s) or use of an empty impinger between the KCl and HNO –H O . If a dry impinger is used, it must be rinsed as discussed in Section 13.2 of this method and the rinse added to the preceding impinger.

7.1.9 *Metering Syste*m— vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3þC (5.4þF), and a dry gas meter or controlled orifice capable of measuring volume to within 2%.

7.1.10 *Barometer*— barometer capable of measuring atmospheric pressure to within 0.33 kPa (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case, the station value (which is the absolute barometric pressure) shall be requested. An adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of negative 0.33 kPa (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

7.1.11 *Gas Density Determination Equipmen*t— temperature sensor and pressure gauge, as described in Section 2.3 and 2.4 of EPA Method 2. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the sensor tip extends beyond the leading edge of the probe sheath and does not touch any metal. Alternative temperature sensor configurations are described in Section 2.1.10 of EPA Method 5. If necessary, a gas analyzer can be used to determine dry moleculer weight of the gas (refer to EPA Method 3).

7.2 *Digestion Apparatus*

7.2.1 *Dry Block Heater or Hot Water Bat*h— a heater capable of maintaining a temperature of 95þC is required for digestion of samples, similar to that described in EPA SW846 Method 7470.

7.2.2 *Ice Bath*

7.2.3 *Digestion Flask*s— Use 50- to 70-mL tubes or flasks with screw caps that will fit a dry block heater. For a water bath, 300-mL biological oxygen demand bottles for SW846 method Reagent Chemicals, American Chemical Society Specifications," Am. Chemical oc.,Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, NY, and the "United States Pharmacopeia." 7470 are to be used. In addition, borosilicate glass test tubes, 35- to 50-mL volume, with rack are needed.

7.2.4 *Microwave or Convection Oven and PTFE Digestion Vessels*— 120 mL, or equivalent digestion vessels with caps equipped with pressure relief valves for the dissolution of ash, along with a capping station or the equivalent to seal the digestion vessel caps. Use a vented microwave or convection oven for heating. In addition, polymethylpentene (PMP) or equivalent volumetric flasks are recommended for the digested ash solutions.

7.3 *Analytical Equipmen*t— dedicated mercury analyzer or equivalent apparatus for the analysis of mercury via CVAAS. Alternatively, CVAFS may be used. CVAAS is a method based on the absorption of radiation at 253.7 nm by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrometer. Absorbency is measured as a function of mercury concentration. A soda-lime trap and a magnesium perchlorate trap must be used to precondition the gas before it enters the absorption cell.

8. Reagents and Materials

8.1 *Purity of Reagents*— Reagent-grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.2 *Purity of Water*— Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type II in ASTM Specification D 1193.

8.3 *Reagents:*

8.3.1 *Boric Acid (H BO)*— purified reagent grade. 3 3

8.3.2 *Hydrochloric Acid (HCl)*— trace metal-grade concentrated hydrochloric acid, with a specific gravity of 1.18.

8.3.3 *Hydrofluoric Acid (HF)*— concentrated hydrofluoric acid, 48%– 50%.

8.3.4 *Hydrogen Peroxide (H O)*— 30% / hydrogen peroxide.

Hydroxylamine Sulfate (NH OH þ H SO)—

Felix, L.G.; Clinard, G.I.; Lacey, G.E.; McCain, J.D. "Inertial Cascade Impactor 7 Substrate Media for Flue Gas Sampling," U.S. Environmental Protection Agency, Research Triangle Park, NC 27711, Publication No. EPA-600/7-77-060; June 1977, 83 p.

8.3.6 *Hydroxylamine Hydrochloride (NH OH þ HCl)*— 10% solution 2

8.3.6 *Sodium Chloride (NaCl)*— solid.

8.3.7 *Mercury Standard Solution*— a certified (1000 µg/mL) mercury standard.

8.3.7 *Nitric Acid (HNO)*— trace metal-grade concentrated nitric acid with a specific gravity of 1.42.

8.3.8 *Potassium Chloride (KCl)*— solid.

8.3.9 *Potassium Permanganate (KMnO)*— solid. 4

8.3.10 *Potassium Persulfate (K S O)*— solid. 2 2 8

8.3.11 *Stannous Chloride (SnCl þ 2H O)*— solid. 2 2

8.3.12 *Sulfuric Acid (H SO)*— trace metal-grade concentrated sulfuric acid, with a specific gravity of 1.84.

8.4 *Materials:*

8.4.1 *Indicating Silica Gel*— with a size of 6– 16 mesh.

8.4.2 *Crushed or Cubed Ice.*

8.4.3 *Sample Filters*— quartz fiber filters, without organic binders, exhibiting at least 99.95% efficiency (<0.05% penetration) for 0.3-µm dioctyl phthalate smoke particles and containing less than 0.2 µg/m of mercury. Test data provided by filter manufacturers and suppliers stating filter efficiency and mercury content are acceptable. However, if no such results are available, determine filter efficiency using ASTM Test Method D 2986, and analyze filter blanks for mercury prior to emission testing. Filter material must be unreactive to sulfur dioxide (SO) or sulfur trioxide (SO).

8.4.4 *Filter Papers*— for filtration of digested samples. The filter paper must have a particle retention of >20 µm and filtration speed of >12 sec.

8.4.5 *Nitrogen Gas (N)*— carrier gas of at least 99.998% purity. Alternatively, argon 2 gas may be used.

8.4.6 *Soda Lime*— indicating 4- to 8-mesh absorbent for trapping carbon dioxide.

8.4.7 *Sample Containers*— glass with PTFE-lined lids.

8.5 *Sampling Reagents*

8.5.1 *KCl Absorbing Solution* (1 mol/L)— Dissolve 74.56 g of KCl in 500 mL of reagent water in a 1000-mL volumetric flask, swirl to mix, and dilute to volume with water. Mix well. A new batch of solution must made prior to each field test.
8.5.2 *HNO –H O Absorbing Solution* (5% / HNO , 10% / H O)— Add slowly, with stirring, 50 mL of concentrated HNO to a 1000-mL volumetric flask containing approximately 3
500 mL of water, and then add carefully, with stirring, 333 mL of 30% / H O . Dilute to volume with water. Mix well. A new batch of solution must made prior to each field test.
8.5.3 H SO -*KMnO Absorbing Solution* (4% / KMnO , 10% / H SO)— Mix carefully, with stirring, 100 mL of concentrated H SO into approximately 800 mL of water.
When mixing, be sure to follow standard acid to water addition procedures and safety precautions associated with strong acids. Then add water, with stirring, to make 1 L. This solution is 10% / v v
H SO . Dissolve, with stirring, 40 g of KMnO into 10% / H SO , and add 10% / H SO , with stirring, to make 1 L. **(Warning**— See 9.1.1). H SO –KMnO absorbing Solution must be made daily.
8.6 *Rinse Solutions for Sample Train*
8.6.1 *0.1 N HNO Solution*— A certified reagent grade 0.1 N HNO solution can be purchased directly or can be made by slowly adding 12.5 mL of concentrated HNO to a 2000-mL volumetric flask containing approximately 500 mL of water, then diluting with water to volume.
8.6.2 *10% / HNO Solution*— Mix carefully, with stirring, 100 mL of concentrated.
HNO into approximately 800 mL of water. When mixing, be sure to follow standard acid to a water addition procedures and safety precautions associated with strong acids. Then add water, with stirring, to make 1 L.
8.6.3 *10% / Hydroxylamine solution*— Add 100 g Hydroxylamine sulfate and 100 grams sodium chloride to a 1000-mL volumetric flask containing approximately 500 mL of water.
After the Hydroxylamine sulfate and sodium chloride has been dissolved, dilute with water to volume. As an alternative a 10% hydroxylamine hydrochloride solution can be used in all cases as
a replacement for the hydroxylamine sulfate/sodium chloride solution.
8.7 *Sample Digestion Reagents*:
8.7.1 *Boric Acid Solution (4% /)*— Dissolve 4 g H BO in water, and dilute to 100 mL.
8.7.2 *Aqua Regia (HCl:HNO 3:1)*— Add 3 parts concentrated HCl to 1 part 3
concentrated HNO . Note that this should be made up in advance and allowed to form a dark 3 orange color. This mixture should be loosely capped, as pressure will build as gases form.
8.7.3 *Saturated Potassium Permanganate Solution (5% /)*— Mix 5 g KMnO into
water, dilute to 100 mL, and stir vigorously.
8.7.4 *Potassium Persulfate Solution (5% /)*— Dissolve 5 g K S O in water, and dilute w
v 2 2 8
to 100 mL.
8.8 *Analytical Reagents*:
8.8.1 *Hydrochloric Acid Solution (10% /)*— Add 100 mL concentrated HCl to water, v
v and dilute to 1 L. Be sure to follow all safety precautions for using strong acids.
8.8.2 *Stannous Chloride Solution (10% / –*Dissolve 100 g in 10% / HCl, and dilute w v
v) v with 10% / HCl to 1 L. Difficulty in dissolving the stannous chloride can be overcome by v
v dissolving in a more concentrated HCl solution (such as 100 mL of 50% / HCl) and diluting to
1 v L with water. Note that care must be taken when adding water to a strong acid solution. Add a

lump of mossy tin (þ0.5 g) to this solution.
8.9 *Mercury Standards*:
8.9.1 *10 mg/L Hg Stock Solution*— Dilute 1 mL of 1000 mg/L Hg standard solution to 100 mL with 10% / HCl. v
8.9.2 *100 µg/L Hg Stock Solution*— Dilute 1 mL of 10 mg/L Hg stock solution to 100 mL with 10% / HCl. v
v
8.9.3 *Working Hg Standards*— Prepare working standards of 1.0, 5.0, 10.0, and 20.0 µg/L Hg from the 100-µg/L stock solution by diluting 1, 5, 10, and 20 mL each to 100 mL with 10% / HCl. v
v
Note 1— If samples to be analyzed are less than 1.0 µg/L Hg, working standards should be prepared at 0.05, 0.1, 0.5, and 1.0 µg/L Hg from a 10-µg/L Hg standard solution.
8.9.4 *Quality Control Standard (QC)*— A quality control standard is prepared from a separate Hg standard solution. The QC standard should be prepared at a concentration of approximately one-half the calibration range.
8.10 *Glassware Cleaning Reagents*— Prior to any fieldwork, all glassware should be cleaned according to the guidelines outlined in EPA Method 29, section 5.1.1

9. Hazards

9.1 *Warning*:
9.1.1 Pressure may build up in the solution storage bottle because of a potential reaction between potassium permanganate and acid. Therefore, these bottles should not be fully filled and should be vented to relieve excess pressure and prevent explosion. Venting must be in a manner that will not allow contamination of the solution.
9.1.2 Hazards to personnel exist in the operation of the cold-vapor atomic absorption spectrophotometer. Refer to the manufacturer's instruction manual before operating the instrument.
9.1.3 Sample digestion with hot concentrated acids creates a safety problem. Observe appropriate laboratory procedures for working with concentrated acids.
9.2 *Precaution:*
9.2.1 The determination of microquantities of mercury species requires meticulous attention to detail. Good precision is generally unattainable without a high level of experience with stack-sampling procedures. Precision may be improved by knowledge of, and close adherence to, the suggestions that follow.
9.2.1.1 All glassware used in the method must be cleaned thoroughly prior to use in the field, as described in Section 8.10 of this method.
9.2.1.2 Use the same reagents and solutions in the same quantities for a group of determinations and the corresponding solution blank. When a new reagent is prepared or a new stock of filters is used, a new blank must taken and analyzed.

10. Sampling

10.1 *Preparation for Test:*
10.1.1 *Preliminary Stack Measurements*— Select the sampling site, and determine the number of sampling points, stack pressure, temperature, moisture, dry molecular weight, and range of velocity head in accordance with procedures of ASTM Test Method D 3154 or EPA Methods 1 through 4.
10.1.2 Select the correct nozzle diameter to maintain isokinetic sampling rates based on the range of velocity heads determined in 10.1.1.

10.1.3 Ensure that the proper differential pressure gauge is selected for the range of velocity heads (refer to EPA Method 2, Section 2.2).
10.1.4 It is suggested that an EPA Method 17 configuration be used; however, if an EPA Method 5 setup is to be used, then select a suitable probe length such that all traverse points can be sampled. Consider sampling from opposite sides of the stack to minimize probe length when a large duct or stack is sampled.
10.1.5 *Sampling Time and Volume*— The total sampling time for this method should be at least 2 but not more than 3 hours. Use a nozzle size that will guarantee an isokinetic gas sample volume between 1.0 dry cubic meters corrected to standard conditions (dscm) and 2.5 dscm. If traverse sampling is done (necessary for sampling at electric utilities), use the same points for sampling that were used for the velocity traverse as stated in Section 10.1.1 of this method. Each traverse point must be sampled for a minimum of 5 minutes.

11. Preparation of Apparatus

11.1 *Pretest Preparation:*
11.1.1 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record the total mass of the silica gel plus container on each container. Alternatively, the silica gel can be weighed directly in the impinger immediately prior to the train being assembled.
11.1.2 Desiccate the sample filters at 20þ ± 5.6þC (68þ ± 10þF) and ambient pressure for 24 to 36 hours, weigh at intervals of at least 6 hours to a constant mass (i.e., <0.5-mg change from previous weighing), and record results to the nearest 0.1 mg. Alternatively, the filters may be oven-dried at 105þC (220þF) for 2 to 3 hours, desiccated for 2 hours, and weighed.
11.1.3 Clean all sampling train glassware as described in Section 8.10 before each series of tests at a single source. Until the sampling train is assembled for sampling, cover all glassware openings where contamination can occur.
11.2 *Preparation of Sampling Train:*
11.2.1 Assemble the sampling train.
11.2.2 Place 100 mL of the KCl solution (see Section 8.5.1 of this method) in each of the first, second, and third impingers.
11.2.3 Place 100 mL of the HNO –H O solution (Section 8.5.2 of this method) in the fourth impinger.
11.2.4 Place 100 mL of the H SO –KMnO absorbing solution (see Section 8.5.3 of this method) in each of the fifth, sixth, and seventh impingers.
11.2.5 Transfer approximately 200 to 300 g of silica gel from its container to the last impinger.
11.2.6 Prior to final train assembly, weigh and record the mass of each impinger. This information is required to calculate the moisture content of the sampled flue gas.
11.2.7 To ensure leak-free sampling train connections and to prevent possible sample contamination problems, use PTFE tape, PTFE-coated O-rings, or other noncontaminating material.
11.2.8 Place a weighed filter in the filter holder using a tweezer or clean disposable surgical gloves.
11.2.9 Install the selected nozzle using a noncontaminating rubber-type O-ring or equivalent when stack temperatures are less than 260þC (500þF) and an alternative gasket material when temperatures are higher. Other connecting systems, such as PTFE ferrules or ground glass joints, may also be used on the probe and nozzle.

11.2.10 Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.
11.2.11 Place crushed or cubed ice around the impingers.
11.2.12 *Leak-Check Procedures*. Follow the leak-check procedures given in Section 4.1.4.1 (Pretest Leak Check), Section 4.1.4.2 (Leak Checks During the Sample Run), and Section 4.1.4.3 (Posttest Leak Checks) of EPA Method 5 or 17.
Note 2— If the flue gas temperature at the sampling location is greater than 260° C (above the temperature where PTFE or rubber-type seals can be used), the posttest leak check is determined beginning at the front end of the probe (does not include nozzle or sample filter holder for EPA Method 17).

12. Calibration and Standardization

12.1 *Sampling Train Calibration:*
12.1.1 *Probe Nozzle*— Refer to Sections 2.1.1 of either EPA Method 5 or 17.
12.1.2 *Pitot Tube*— Refer to Section 4 of EPA Method 2.
12.1.3 *Metering System*— Refer to Section 5.3 of either EPA Method 5 or 17.
12.1.4 *Probe Heater*— Refer to Section 7.1.7.1 and 7.1.7.2 of this method.
12.1.5 *Temperature Gauges*— Refer to Section 4.3 of EPA Method 2.
12.1.6 *Leak Check of the Metering System*— Refer to Section 5.6 of EPA Method 5 or Section 5.5 of EPA Method 17.
12.1.7 *Barometer*— Calibrate the barometer to be used against a mercury barometer.
12.2 *Atomic Absorption or Atomic Fluorescence Spectrometer Calibration*— Perform instrument setup and optimization according to the manufacturer's specifications. Cold-vapor generation of mercury is performed via addition of stannous chloride solution to reduce oxidized mercury to its elemental state. The mercury-laden solution is then purged with a carrier gas into the atomic absorption cell. This procedure is used to calibrate the instrument using 10% / HCl as the blank along with the standards described in Section 8.9.3. Calibration is verified by analyzing the QC standard prepared according to Section 8.9.4 of this method.

13. Procedures

13.1 *Sampling Train Operation:*
13.1.1 Maintain an isokinetic sampling rate within 10% of true isokinetic. For an EPA Method 5 configuration, maintain sample filter exit gas stream temperatures and probe within ±15þC of the flue gas temperature at the sampling location. However, at no time, regardless of the sample configuration, must the sample filter, probe, or connecting umbilical cord temperature be lower than 120 C.
13.1.2 Record the data, as indicated in Figure 2, at least once at each sample point but not less than once every 5 minutes.
13.1.3 Record the dry gas meter reading at the beginning of a sampling run, the beginning and end of each sampling time increment, before and after each leak check, and when sampling is halted.
13.1.4 Level and zero the manometer. Periodically check the manometer level and zero, because it may drift during the test period.
13.1.5 Clean the port holes prior to the sampling run.
13.1.6 Remove the nozzle cap. Verify that the filter and probe heating systems are up to temperature and that the pitot tube and probe are properly positioned.
Note 3— For an EPA Method 5 configuration, prior to starting the gas flow through the system, the sample filter exit gas temperature may not be at the hot box temperature. However, if the

system is set up correctly, once flow is established, the sample filter exit gas temperature will quickly come to equilibrium.
13.1.7 Start the pump. Position the nozzle at the first traverse point with the nozzle tip pointing in the direction of flow. Seal the openings around the probe and port hole to prevent unrepresentative dilution of the gas stream. Read the pitot tube manometer, start the stopwatch, open and adjust the control value until the isokinetic sampling rate is obtained (refer to Section 4.1.5 from either EPA Method 5 or 17 for information on isokinetic sampling rate computations), and maintain the isokinetic rate at all points throughout the sampling period.
13.1.8 When sampling at one traverse point has been completed, move the probe to the next traverse point as quickly as possible. Close the coarse adjust valve, and shut the pump off when transferring the probe from one sample port to another. Exclude the time required to transfer the probe from one port to another from the total sampling time.
13.1.9 Traverse the stack cross section, as required by EPA Method 1.
13.1.10 During sampling, periodically check and, if necessary, adjust the probe and filter exit sample gas temperatures, as well as the zero of the manometer.
13.1.11 Add more ice, if necessary, to maintain a temperature of <20 C (68 F) at the condenser/silica gel outlet.
13.1.12 Replace the filter assembly if the pressure drop across the filter becomes such that maintaining isokinetic sampling is no longer possible. Conduct a leak check (refer to EPA Method 5 or 17, Section 4.1.4.2) before installing a new filter assembly. The total particulate mass and determination of particle-bound mercury includes all filter assembly catches.
13.1.13 In the unlikely event depletion of KMnO via reduction reactions with flue gas $_4$ constituents other than elemental mercury occurs, it may render it impossible to sample for the desired minimum time. This problem is indicated by the complete bleaching of the purple color of
the acidified permanganate solution. If the purple color is lost in the first two H SO –KmnO impingers, then the sample must be repeated. If the gas stream is known to contain large amounts of reducing constituents (i.e., >2500 ppm SO) or breakthrough has occurred in previous sampling runs, then the following modification is suggested: the amount of HNO –H O (10% /). in the fourth impinger should be doubled, and/or a second HNO –H O impinger should be used $_3$ to increase the oxidation capacity for reducing gas components prior to the H SO –KMnO $_{2\,4\,4}$ impingers.
13.1.14 Use a single train for the entire sample run, except when simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct or when equipment failure necessitates a change of trains.
13.1.15 At the end of a sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, record the final dry gas meter reading, and conduct a posttest leak check, as described in Section 4.1.4.3 of EPA Method 5. Also, leak-check the Pitot lines as described in EPA Method 2, Section 3.1. The lines must pass the leak check to validate the velocity head data.
13.1.16 Calculate percent isokinetic to determine whether the run was valid or another test run should be performed (refer to EPA Method 5 or 17).
4.1.5 from either EPA Method 5 or 17 for information on isokinetic sampling rate computations), and maintain the isokinetic rate at all points throughout the sampling period.
13.1.8 When sampling at one traverse point has been completed, move the probe to the next traverse point as quickly as possible. Close the coarse adjust valve, and shut the pump off

when transferring the probe from one sample port to another. Exclude the time required to transfer the probe from one port to another from the total sampling time.
13.1.9 Traverse the stack cross section, as required by EPA Method 1.
13.1.10 During sampling, periodically check and, if necessary, adjust the probe and filter exit sample gas temperatures, as well as the zero of the manometer.
13.1.11 Add more ice, if necessary, to maintain a temperature of <20 C (68 F) at the condenser/silica gel outlet.
13.1.12 Replace the filter assembly if the pressure drop across the filter becomes such that maintaining isokinetic sampling is no longer possible. Conduct a leak check (refer to EPA Method 5 or 17, Section 4.1.4.2) before installing a new filter assembly. The total particulate mass and determination of particle-bound mercury includes all filter assembly catches.
13.1.13 In the unlikely event depletion of KMnO via reduction reactions with flue gas 4 constituents other than elemental mercury occurs, it may render it impossible to sample for the desired minimum time. This problem is indicated by the complete bleaching of the purple color of the acidified permanganate solution. If the purple color is lost in the first two H SO –KmnO impingers, then the sample must be repeated. If the gas stream is known to contain large amounts of reducing constituents (i.e., >2500 ppm SO) or breakthrough has occurred in previous sampling runs, then the following modification is suggested: the amount of HNO –H O (10% /) in the fourth impinger should be doubled, and/or a second HNO –H O impinger should be used to increase the oxidation capacity for reducing gas components prior to the H SO –KmnO impingers.
13.1.14 Use a single train for the entire sample run, except when simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct or when equipment failure necessitates a change of trains.
13.1.15 At the end of a sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, record the final dry gas meter reading, and conduct a posttest leak check, as described in Section 4.1.4.3 of EPA Method 5. Also, leak-check the Pitot lines as described in EPA Method 2, Section 3.1. The lines must pass the leak check to validate the velocity head data.
13.1.16 Calculate percent isokinetic to determine whether the run was valid or another test run should be performed (refer to EPA Method 5 or 17).
13.2 *Sample Recovery:*
13.2.1 Allow the probe to cool before proceeding with sample recovery. When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle, and place a rinsed, noncontaminating cap over the probe nozzle to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling; a vacuum can form in the filter holder, with the undesired result of drawing liquid from the impingers onto the filter.
13.2.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train, and cap the open outlet. Be careful not to lose any condensate that may be present. Cap the filter inlet where the probe was fastened. Remove the umbilical cord from the last impinger, and cap the impinger. Cap the filter holder outlet and impinger inlet. Use noncontaminating caps, such as ground-glass stoppers, plastic caps, serum caps, or PTFE tape, to close these openings.
13.2.3 Alternatively, the following procedure may be used to disassemble the train before the probe and filter holder/oven are completely cooled. Initially disconnect the filter holder

outlet/impinger inlet, and loosely cap the open ends. Then disconnect the probe from the filter holder or cyclone inlet, and loosely cap the open ends. Cap the probe tip, and remove the umbilical cord as previously described.

13.2.4 Transfer the probe and filter– impinger assembly to a clean area that is protected from the wind and other potential causes of contamination or loss of sample. Inspect the train before and during disassembly, and note any abnormal conditions.

13.2.5 The impinger train sample recovery scheme is illustrated in Figure 3.

13.2.6 *Container 1 (Sample Filter)*— Carefully remove the sample filter from the filter holder so as not to lose any ash, weigh filter and ash, and place the filter in a labeled petri dish container. To handle the filter, use either acid-washed polypropylene or PTFE-coated tweezers or clean, disposable surgical gloves rinsed with water and dried. If it is necessary to fold the filter, make certain the particulate cake is inside the fold. Transfer any particulate matter or filter fibers that adhere to the filter holder gasket to the filter in the petri dish. A dry (acid-cleaned) nonmetallic bristle brush should be used to remove any remaining particulate matter. Do not use any metal-containing materials when recovering this train. Immediately cover and seal the labeled petri dish.

13.2.7 *Container 2/2a (All Rinses in Front of the Sample Filter)*

13.2.7.1 *Case 1: Includes Gravimetric Particulate Determination in Addition to Mercury*

Quantitatively recover particulate matter and any condensate from all components prior to the sample filter. A nonmetallic brush may be used for removing particulate matter. All front-half components (all components prior to the sample filter) are then rinsed with acetone as outlined in EPA Method 5 or 17. The acetone rinse is then placed into a container (Container 2a) for which the tare weight has been recorded. Container 2a, with a ribbed watch glass over the top, is placed in a fume hood until the acetone has completely evaporated. After the front-half components have been rinsed with acetone, then rinse these components with 0.1 N HNO . The 0.1 N HNO rinse is placed in Container 2.

13.2.7.2 *Case 2: Mercury Determination Only (No Acetone Rinse)*

Quantitatively recover particulate matter and any condensate from all components prior to the sample filter. A nonmetallic brush may be used for removing particulate matter. The front-half components are then rinsed with 0.1 N HNO , and this rinse is placed in Container 2. 3

13.2.8 *Container 3 (Impingers 1 through 3, KCl Impinger Contents and Rinses)*:

13.2.8.1 Dry the exterior surfaces of Impingers 1, 2, and 3. Then weigh and record the mass of each impinger (to the nearest 0.5 g).

13.2.8.2 Clean the filter support, the back half of the filter housing, and connecting glassware by thoroughly rinsing with 0.1 N HNO . Pour the rinse into a glass sample Container 3

13.2.8.3 **Carefully add small amounts of 5% / KMnO solution very slowly to each** w **KCl impinger and gently mix the impinger solution. Continue adding KMnO solution** 4 **until a purple color is obtained. Let the impingers sit for approximately 15 minutes to ensure the purple color persists.**

13.2.8.4 Pour all of the liquid from the three KCl impingers into Container 3.

13.2.8.5 Rinse the impingers and connecting glassware with 10% / HNO . Although v unlikely, if deposits remain on the impinger surfaces, remove them by doing another 10% / v HNO rinse that has a very small amount (several drops) of 10% / hydroxylamine solution 3 v added to the HNO rinse solution. Rinse each of the KCl impingers with this solution until the 3

brown stains are removed. Add these rinses to Container 3. If the solution in Container 3 becomes clear, add a small amount of the 5% / KMnO solution until a pink or slightly purple color is obtained. Check again after 90 min to ensure the purple color remains.
13.2.8.6 Perform a final rinse of the impingers and connecting glassware with 0.1 N HNO , 3 and add to Container 3.
13.2.8.7 Do a final rinse of all glass components with water which is discarded.
13.2.8.8 Mark the height of the fluid level in Container 3, seal, and clearly label the contents.
13.2.9 *Container 4 (Impinger 4, HNO –H O Impinger Contents and Rinses):* 3 2 2
13.2.9.1 Dry the exterior surfaces of Impinger 4. Then weigh and record the mass of this impinger (to the nearest 0.5 g).
13.2.9.1 Pour the HNO –H O absorbing solution into sample Container 4. 3 2 2
13.2.9.2 Rinse the H O –HNO impinger and connecting glassware a minimum of two times 2 2 3 with 0.1 N HNO , and pour the rinses into Container 4. Do a final rinse with water and discard 3 water.
13.2.10 *Container 5 (Impingers 5 through 7, H SO –KMnO Impinger Contents and* 2 4 4 *Rinses):*
13.2.10.1 Dry the exterior surfaces of Impingers 5, 6, and 7. Then weigh and record the mass of each impinger (to the nearest 0.5 g).
13.2.10.2 Pour all of the liquid from the three H SO –KMnO impingers into a glass 2 4 4 sample Container 5.
13.2.10.3 Rinse the H SO –KMnO impingers and connecting glassware a minimum 2 4 4 **of two times with 0.1 N HNO , and pour the rinses into Container 5. A third rinse must** 3 **then be done (this rinse will remove any brown stains from the surface of the impingers). This rinse consists of 0.1N HNO and several drops of 10% / hydroxylamine solution** 3 v **(either the NH OH/NaCl solution or the NH OHþ þHCl solution). This rinse must have** 2 2 **enough 10% / hydroxylamine solution such that the brown stains are easily removed. If** w **they are not easily removed add several more drops of 10% / hydroxylamine solution un the stains are completely gone. Add this rinse to Container 5. If the solution in Container 5 becomes clear, add small amounts of the H SO –KMnO solution until a pink or slightly** 2 4 4 **purple color is obtained.**
13.2.10.4 Perform a final 0.1 N HNO rinse of the impingers and connecting glassware 3 follow by a water rinse. The 0.1 N HNO rinse is added to Container 5, and the water rinse is 3 discarded.
13.2.10.5 Mark the height of the fluid level, seal the container, and clearly label the contents.
Note 4— As stated earlier in the warning in Section 9.1.1, pressure can build up in the sample storage flask because of the potential reaction of KMnO with acid. Do not fill the container 4 completely, and take precautions to relieve excess pressure.
13.2.11 *Container 6 (Impinger 8, Silica Gel Impinger Contents*):
13.2.11.1 Dry the exterior surfaces of Impinger 8. Then weigh and record the mass of this impinger (to the nearest 0.5 g).
13.2.11.2 Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. If spent, the silica gel must be either regenerated or disposed of.
13.2.12 *Solution Blanks (Containers 7– 11)*

Solution blanks are taken each time new reagents are prepared. *Note:* The amount of solution collected for the blanks stated below is a suggested volume.

13.2.12.1 *Container 7 (0.1 N HNO Blank)*— Place 50 mL of the 0.1 N HNO solution used in the sample recovery process into a properly labeled container. Seal the container.

13.2.12.2 *Container 8 (1 N KCl Blank)*— Place 50 mL of the 1 N KCl solution used as the impinger solution into a properly labeled container. Seal the container.

13.2.12.3 *Container 9 (5% / HNO –10% / H O Blank)*— Place 50 mL of the HNO –H O solution used as the nitric acid impinger reagent into a properly labeled container. Seal the container.

13.2.12.4 *Container 10 (H SO –KMnO Blank)*— Place 50 mL of the H SO –KMnO solution used as the impinger solution in the sample recovery process into a properly labeled container. Refer to **Note 4** in Section 13.2.10.5 of this method.

13.2.12.5 *Container 11 (10% / Hydroxylamine Solution)*— Place 100 mL of hydroxylamine solution into a properly labeled sample container. Seal the container.

13.2.13 *Container 12 (Sample Filter Blank)*— Once during each field test, place into a properly labeled petri dish three unused blank filters from the same lot as the sampling filters. Seal the petri dish.

13.2.14 After all of the samples have been recovered, they must be analyzed within 45 days.

13.2.15 After all impingers and connectors have been properly rinsed and the solutions recovered, the glassware should be cleaned according to the procedures in Section 8.10 or triple-rinsed with 10% / HNO followed by a rinsing with water. If a new source is to be sampled or if there are any brown stains on the glassware, then the glassware must be cleaned according to procedures in Section 8.10 of this method. If multiple sites are to sampled during a single mobilization, an exception to this procedure will be allowed. In this case, a triple rinsing of the glassware with 10% / HNO solution followed by a water rinse prior to sampling can be used as an alternative to the procedures in Section 8.10. However, if there are any brown stains on the glassware, then the glassware must be cleaned according to procedures in Section 8.10 of this method.

13.3 *Sample Preparation:*

13.3.1 *Ash Sample (Containers 1 and 2)*

13.3.1.1 *Case 1: Includes Gravimetric Particulate Determination in Addition to Mercury*— The gravimetric particulate loading is determined from the mass of the ash on the filter (Container 1) and the residual particulate from the acetone rinse (Container 2a), as outlined in EPA Method 5 or 17. If a large amount of ash is on the filter, carefully remove the ash to create a raw ash sample from which a representative weighed aliquot can be taken for digestion. If the mass of ash collected on the filter is small (less than 0.5 g), digest the entire filter along with the ash. Dissolve the residual particulate from Container 2a using concentrated HNO . This solution is then added to Container 2 (0.1 N HNO probe rinse). The ash material from Container 1 is then digested using the procedures described in Section 13.3.2 of this method. The same procedure is used to determine the mercury on the sample filter blank.

Use a modification of EPA SW 846 7470 to digest the sample in Container 2 prior to analysis. The main modification is that the volumes of reagents and sample have been reduced tenfold to reduce waste. This reduction in reagent volume is acceptable because modern dedicated mercury analyzers do not require the large volumes that previous manual methods required. Transfer a

10-mL aliquot of the sample to a digestion tube with a screw cap.
13.3.1.2 *Case 2: Mercury Determination Only*— The same procedures are followed as described previously in Section 13.3.1.1 with the exception that there is no Container 2a.
13.3.2 *Ash Digestion*— Accomplish the complete dissolution of ash by one of the following methods or an equivalent alternative method. The following methods are for the dissolution of inorganic samples, such as ash or sediments, when an analysis of trace elements including mercury is done.
13.3.2.1 *Microwave Digestion*— The use of this method assumes proper training in microwave digestion techniques. In addition, this method is tailored for a CEM (continuous emission monitor) microwave digestion system. A 0.5-g ash sample, accurately weighed to 0.0001g, is placed in a PTFE microwave digestion vessel with 3 mL of concentrated HF, 3 mL of concentrated HNO_3, and 3 mL of concentrated HCl. The vessel is sealed and placed in the microwave (along with other vessels). The vessels are slowly heated to a pressure of 347 kPa (50 psi), which is held for 5 minutes, followed by heating to a pressure of 550 kPa (80 psi), which is held for 20 minutes. The vessels are allowed to cool to room temperature before venting. 15 mL of 4% / boric acid is added to each vessel. The vessels are sealed and placed in the microwave again. The vessels are slowly heated back to a pressure of 347 kPa (50 psi) and held for 10 minutes. The vessels are again allowed to cool to room temperature before venting. The contents of each vessel are quantitatively transferred to a 50-mL PMP or polypropylene (PP) volumetric flask and diluted; note that care must be taken in adding water to a strong acid solution.
13.3.2.2 *Conventional Digestion*— The use of this method assumes proper training in PTFE bomb digestion techniques. Place a 0.5-g ash sample, accurately weighed to 0.0001 g, in a PTFE digestion vessel with 7 mL of concentrated HF and 5 mL of aqua regia. Seal the vessel, and place it in an oven or water bath at 90þC for a minimum of 8 hours (these may be heated overnight). Cool the vessel to room temperature before venting. Add 3.5 g of boric acid and 40 mL of water to each vessel. Seal the vessels, and place them in the oven or water bath for an additional 1 hour. Cool the vessels again to room temperature before venting. Quantitatively transfer the contents of each vessel to a 100-mL PMP, PP, or glass volumetric flask and dilute. Note that care must be taken in adding water to a strong acid solution.
13.3.3 *Preparation of Aqueous KCl Impinger Solution (Containers 3 and 8)*— Dilute sample in a 500-mL volumetric flask to volume with water, and mix. Use a modification of EPA SW 846 7470 to digest the sample prior to analysis. The main modification is that the volumes of reagents and sample have been reduced tenfold to reduce waste. This reduction in reagent volume is acceptable because modern dedicated mercury analyzers do not require the large volumes that previous manual methods required. Transfer a 10-mL aliquot of the sample to a digestion tube with a screw cap. Add 0.5 mL of concentrated H_2SO_4, 0.25 mL of concentrated HNO_3, and 1.5 mL of 5% / $KMnO_4$ solution. Mix the solution, and allow it to stand for 15 minutes. Add 0.75 mL of 5% / $K_2S_2O_8$ solution, and loosely cap the tube. Place the tube in a dry block heater or water bath equipped with a temperature probe, and heat to 95þC. Do not allow the temperature to exceed 95þC. Hold the sample at 95þC for 2 hours before allowing it to cool to room temperature. The purple color from the added $KMnO_4$ solution must remain throughout the digestion. Clearing of the solution during the heating indicates the depletion of $KMnO_4$. If the solution goes clear add more $KMnO_4$ to the sample until a purple color persists. Prior to analysis, add 1 mL of 10% / hydroxylamine sulfate solution to the sample. The sample solution should remain clear after addition of hydroxylamine sulfate. Record the volumes of the solution additions used in the preparation procedure and adjust the DF factor in equation 9 as necessary.

13.3.4 *Preparation of HNO –H O Impinger Solution (Containers 4 and 9)*— Dilute $_{3\,2\,2}$ sample in a 250-mL volumetric flask to volume with water, and mix. Treat the sample with a modified version of EPA SW 846 7470. Modifications to the method are necessary to properly treat the H O -containing impinger solution before the analysis with CVAAS. The modifications include the addition of HCl, the use of an ice bath during the KMnO addition, and the slow $_{4}$ addition of the KMnO . Transfer a 5-mL aliquot of the sample to a digestion tube with a screw $_{4}$ cap. Add 0.25 mL of concentrated HCl, 0.25 mL of concentrated H SO , place the tube in an ice $_{2}$ bath, and allow it to cool for 15 minutes. The destruction of H O is accomplished by slow $_{2\,2}$ addition of saturated KMnO solution in 0.25-mL increments along the inside of the digestion $_{4}$ tube. The violence of this reaction requires careful, slow addition of the KMnO for safety reasons and to avoid loss of analyte. Cool the sample for 15 minutes in between each addition, and mix the sample prior to each addition. After the first five additions, increase the increments to 0.5 mL. Carry out the addition of KMnO until the solution remains purple, indicating complete reaction of the H O . Record the volume of saturated KMnO solution added to the sample. Add 0.75 mL of 5% / K S O solution to the sample, and then cap the tube loosely. Place the tubes in a dry block heater or water bath equipped with a temperature probe, and heat to 95þC. Do not allow the temperature to exceed 95þC. Maintain the sample at 95þC for 2 hours before allowing it to A Comprehensive Assessment of Toxic Emissions from Coal-Fired Power Plants: Phase I Results from the U.S. Department of Energy Study," Prepared for the U.S. Department of Energy Federal Energy Technology Center, Contract No. DE-FC21-93MC30097, Energy & Environmental Research Center, University of North Dakota, Grand Forks, ND, 1996. cool to room temperature. Note that the purple color due to KMnO must remain throughout the $_{4}$ digestion. Clearing of the solution during the heating indicates the depletion of KMnO . Before $_{4}$ doing the analysis, add 1mL 10% / of hydroxylamine sulfate solution to the sample. The sample should then become clear. Record the volumes of the solution additions used in the preparation procedure and adjust the DF factor in equation 13 as necessary.

13.3.5 *Preparation of H SO –KMnO Impinger Solution (Containers 5 and 10)*— Prepare $_{2\,4\,4}$ the entire solution immediately prior to analysis. Dissolve by incrementally adding approximately 500 mg of solid hydroxylamine sulfate into the sample until a clear, colorless solution persists.

(This is to ensure that a representative aliquot sample can be taken and that any mercury contained in the manganese dioxide that forms from the permanganate solution will be removed**).** Add the hydroxylamine slowly because of the violence of this reaction. Dilute the sample in a 500-mL volumetric flask to volume with water, and mix. Transfer a 10-mL aliquot of the sample to a digestion tube with a screw cap. Add 0.75 mL of 5% / K S O solution and 0.5mL of $_{w}$ concentrated HNO , and loosely cap the tube. Place the tube in a dry block heater or water bath $_{3}$ equipped with a temperature probe, and heat to 95þC. Do not allow the temperature to exceed 95þC. Hold the sample at 95þC for 2 hours before allowing it to cool to room temperature. The purple color of the KMnO solution must remain throughout the digestion. Clearing of the $_{4}$ solution during the heating indicates the depletion of KMnO . Prior to analysis, add 1 mL of $_{4}$ 10% / of hydroxylamine sulfate solution to the sample. The sample solution should remain clear after addition of hydroxylamine sulfate. Record the volumes of the solution additions used in the preparation procedure and adjust the DF factor in equation 12 as necessary.

13.3.6 *Simplification of the Digestion*— If an acetone rinse was not used for gravimetric particulate determination or it is very clear, there is insignificant organic material present in the sampled gas stream; then the digestion procedure for the HNO –H O and H SO –KMnO $_{3\,2\,2\,2\,4\,4}$

impinger solutions may be simplified by omitting the persulfate digest. The persulfate digest is performed for the purpose of oxidizing certain organics. Because this method is specific to coal combustion systems where organic compounds are usually insignificant, this digest may be 8 omitted because the H O is sufficient to oxidize most compounds. The decision to omit this 2 2 procedure should be made based on the gas stream being sampled and/or verification that organics resistant to H O oxidation are not present. If unsure whether organics are present or if an acetone rinse has been used, then the total digestion procedure is required.

13.3.6.1 *Simplified Procedure for the Preparation of HNO –H O Impinger* 3 2 2 *Solution*— If the simplified procedure can be used for the HNO –H O impinger solution, the 3 2 2 concentrated H SO and 5% / K S O are not added to the HNO –H O aliquot sample. Also it is not necessary to heat the sample to 95þC followed by 2 hours of cooling. However, it is still necessary that the concentrated HCl be added to the solution.

Just before doing the analysis, add 1mL 10% / of hydroxylamine solution to the sample. The w sample should then become clear. If the simplified procedure is used, V(K S O) and V(H SO) 2 2 are zero when calculating DF in Equation 12 Section 15.

13.3.6.2 *Simplified procedure for the Preparation of H SO –KMnO Impinger* 2 4 4 *Solution*— If the simplified procedure can be used for the H SO –KMnO impinger solution, the 2 concentrated HNO and 5% / K S O are not added to the H SO –KMnO aliquot sample. Also 3 v 2 2 it is not necessary to heat the sample to 95þC followed by 2 hours of cooling. Just before doing the analysis, add 1mL 10% / of hydroxylamine solution to the sample. The sample should then w become clear. If the simplified procedure is used, V(K S O) and V(HNO) are zero when 2 2 8 3 calculating DF in Equation 13 Section 15.

13.3.7 *0.1 N HNO and 10% / Hydroxylamine Rinse Solutions (Containers 7 and* 3 v *11)*— These solutions can be analyzed directly for mercury without any preparation steps.

13.4 *Sample Analysis*— Analyze all of the prepared solutions by CVAAS or CVAFS following the guidelines specified by the instrument manufacturer

13.4.1 *QA/QC*— For this method, it is important that both the sampling team and analytical people be very well trained in the procedures. This is a complicated method that requires a high-level of sampling and analytical experience. For the sampling portion of the QA/QC procedure, both solution and field blanks are required. It should be noted that if high-quality reagents are used and care is taken in their preparation and in the train assembly, there should be little, if any, mercury measured in either the solution or field blanks.

As stated in Section 13.2.12 of this method, solution blanks will be taken and analyzed every time a new batch of solution is prepared. If mercury is detected in these solution blanks, the concentration is subtracted from the measured sample results. The maximum amount that can be subtracted is 10% of the measured result or 10 times the detection limit of the instrument which ever is lower. If the solution blanks are greater than 10% the data must be flagged as suspect.

A field blank is performed by assembling an impinger train, transporting it to the sampling location during the sampling period, and recovering it as a regular sample. These data are used to ensure that there is no contamination as a result of the sampling activities. A minimum of one field blank at each sampling location must be completed for each test site. Any mercury detected in the field blanks cannot be subtracted from the results. Whether or not the mercury detected in the field blanks is significant is determined based on the QA/QC procedures established prior to the testing. At a minimum, if field blanks exceed 30% of the measured value at the orresponding location, the data must be flagged as suspect.

The QA/QC for the analytical portion of this method is that every sample, after it has been

prepared, is to be analyzed in duplicate with every tenth sample analyzed in triplicate. These results must be within 10% of each other. If this is not the case, then the instrument must be recalibrated and the samples reanalyzed. In addition, after every ten samples, a known spike sample must be analyzed. For the ash samples, a certified reference ash sample (may be purchased

$$V_{m(std)} = V_m Y \frac{T_{std}}{T_m} \frac{P_{bar} + \Delta H}{P_{std}} = K_1 V_m Y \frac{P_{bar} + \Delta H}{T_m}$$

$$[V_m - (L_p - L_a)\theta]$$

[Eq. 1]

from NIST) is to be digested and analyzed at least once during the test program. It is also suggested that the QA/QC procedures developed for a test program include submitting, on occasion, spiked mercury samples to the analytical laboratory by either the prime contractor if different from the laboratory or an independent organization.

14. Flue Gas Calculations

14.1 *Dry Gas Volume*— Calculate the dry gas sample volume, $V_{m(std)}$, at standard conditions using Equation 1.

where:

P_{bar} = barometric pressure at the sampling site, kPa (in. Hg)

P_{std} = standard absolute pressure, 101.3 kPa (29.92 in. Hg)

T_m = absolute average dry gas meter temperature (refer to Figure 2), K (°R)

T_{std} = standard absolute temperature, 293 K (528°R)

V_m = volume of gas sample as measured by dry gas meter, dcm (dscf)

$V_{m(std)}$ = volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf)

Y = dry gas meter calibration factor

ΔH = average pressure differential across the orifice meter (refer to Figure 2), kPa (in. Hg)

K_1 = 2.894 K/kPa (17.64°R/in. Hg)

Note 5— Equation 1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., leak checks conducted prior to component changes or following the test) exceeds the maximum acceptable leakage rate, L_a, equal to 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate, whichever is less. If the leakage rate observed during the posttest leak check, L_p, or an individual leakage rate observed during the leak check conducted prior to the "ith" component change (I = 1, 2, 3, . . .n), L_i, exceeds L_a, then Equation 1 must be modified as follows:

(a) **Case** I. No component changes made during sampling run. In this case, replace V_m with the expression:

where:

L_p = leakage rate observed during the posttest leak check, m^3/min (cfm)

$$V_m - (L_1 - L_a)\theta 1 - \theta \frac{n}{i - 1}$$

$(L_i - L_a)\theta_i + (L_p - L_a)\theta_p$

$V_{w(std)} = W_{lc} R T_{std}$

$M_w P_{std}$

$= K_2 W_{lc}$

$B_{ws} = V_{w(std)}$

$V_{m(std)} = V_{w(std)}$

[Eq. 2]

[Eq. 3]

L = maximum acceptable leakage rate for either a pretest leak check or for a leak check $_a$ following a component change— equal to 0.00057 m /min (0.02 cfm) or 4% of the ^{3} average sampling rate, whichever is less

θ = total sampling time, min

(b) **Case II**. One or more component changes made during the sampling run. In this case, replace V with the expression: $_m$

where:

θ_i = sampling time interval, from the beginning of a run until the first component change, min and substitute only for those leakage rates (L or L) that exceed L . $_{i\,p\,a}$

14.2 *Volume of Water Vapor*— Calculate the volume of water vapor of the stack gas using Equation 2.

where:

M = molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole) $_w$

R = ideal gas constant, 0.008314 kPa-m /K-g-mole (21.85 in. Hg-ft /θR-lb-mole) $^{3\,3}$

W = total mass of liquid collected in impingers and silica gel (refer to Figure 2), g $_{lc}$

V = volume of water vapor in the gas sample, corrected to standard conditions, scm (scf) $_{w(std)}$

K = 0.001336 m /mL (0.04707 ft /mL) $_2$

$^{3\,3}$

14.3 *Volume of Moisture*— Calculate the moisture content, B , of the stack gas using $_{ws}$ Equation 3.

where:

B = water vapor in the gas stream, proportion by volume $_{ws}$

15. Calculations for Particle-Bound, Oxidized, Elemental, and Total Mercury Concentrations:

15.1 *Particle-Bound Mercury*

15.1.1 *Case 1: Amount of Ash on the Filter is Greater Than 0.5* g— Calculate the concentration of mercury in µg/g in the ash sample (Hg) using Equation 4: $_{ash}$

Hg , µg/g = (IR)(DF) [Eq. 4] $_{ash}$

where:

IR = instrument reading, µg/L

DF = dilution factor = (total digested volume, L)/(mass of ash digested, g)

Calculate the amount of mercury in the probe rinse (Hg , Container 2) in µg using Equation 5: $_{pr}$

Hg , µg = (IR)(V) [Eq. 5] $_{pr\,1}$

where:

IR = instrument reading, µg/L

V = total volume of probe rinse sample from which sample aliquot was taken, L $_1$

Equation 5 assumes no preparation steps are needed prior to analyzing the probe rinse for mercury using CVAA. Although not required, a persulfate digest can be done on the probe rinse

sample as discussed in section 13.3.3. If the persulfate digest is done equation 5 becomes
Hg , µg = (IR)(V)(DF) where DF is the same as equation 9. pr l
Calculate the amount of mercury on the sample filter blank (Hg) in the same way using
Equation fb
6.
Hg , µg = (IR)(V) [Eq. 6] fb 2
where:
IR = instrument reading, µg/L
V = total volume of sample filter blank digest, L 2
The total amount of particle-bound mercury (Hg) is then determined using Equation 7: tp
Hg (particle), µg = (Hg)(W) – Hg + Hg [Eq. 7] ash ash fb pr
where:
W = the total mass of ash on filter, g ash
The concentration of particle-bound mercury (µg/dscm) in the gas stream is then determined
using Equation 8
Hg , µg/dscm = Hg (particle)/V [Eq. 8] tp
m(std)
where:
V = is the total volume of dry gas sampled at standard (normal) conditions, dscm m(std)
15.1.2 *Case 2: Amount of Ash on the Filter is Less Than 0.5* g— The calculation is the
same as in Case 1 except the entire sample (ash and filter) is digested; therefore, DF in Equation
4
is defined only by the total digested volume. Equations 5– 7 remain the same.
15.2 *Oxidized Mercury*
15.2.1 *KCl Solution (Impingers 1– 3)*— Calculate the concentration of mercury in µg/L in
the KCl impinger solutions using Equation 9:
Hg , µg/L = (IR)(DF) [Eq. 9] KCl
where:
IR = instrument reading, µg/L
DF = dilution factor, V + V(H SO) + V(HNO) + V(KMnO) + V(K S O) + V(NH OH) D 2 4 3 4 2 2 8 2
VD
V = total digested volume, 10 mL D
V(H SO) = volume of added concentrated H SO , 0.5 mL 2 4 2 4
V(HNO) = volume of added concentrated HNO , 0.5 mL 3 3
V(KMnO) = volume of added 5% / KMnO , 1.5 mL 4 V 4
W
V(K S O) = volume of added 5% / K S O , 0.75 mL 2 2 8 V 2 2 4
W
V(NH OH) = volume of added 10% / hydroxylamine sulfate, 1.0 mL 2 V
W
The amount of mercury in the KCl solution blank is calculated in the same way.
15.2.2 *Total Oxidized Mercury (Hg)*— is defined by method as the mercury measured in *o*
the KCl sample minus the mercury measured in the KCl solution blanks, as shown in Equation
10:
Hg , µg = (Hg)(V) – (Hg)(V) [Eq. 10] o KCl 3 Ob 3
where:
Hg = Mercury concentration measured in KCl aliquot, µg/L KCl
V = Total volume of aqueous KCl from which sample aliquot was taken, L 3

Hg = Mercury concentration measured in KCl solution blank aliquot, µg/L Ob
The concentration of Hg (µg/dscm) in the gas stream is then determined using Equation 11: 2+
Hg , µg/dscm = Hg /V [Eq. 11] 2+
O m(std)
where:
V is the total volume of dry gas sampled at standard conditions, dscm m(std)
15.3 *Elemental Mercury*
15.3.1 *HNO –H O Solution (Impinger 4)*— Calculate the concentration of mercury in 3 2 2
µg/L in the HNO –H O impinger solution using Equation 12: 3 2 2
Hg , µg/L = (IR)(DF) [Eq. 12] H2O2
where:
IR = instrument reading, µg/L
DF = dilution factor, V + V(HCl) + **V(H SO)** + V(KMnO) + V(K S O) + V(NH OH) D 2 4 4 2 2 8 2
VD
V = total digested volume, 5 mL D
V(HCl) = volume of added concentrated HCl, 0.25 mL
V(H SO) = volume of added concentrated H SO , 0.5 mL 2 4 2 4
V(KMnO) = volume of added saturated KMnO , mL (volume need to turn sample to a purple 4 4
color)
V(K S O) = volume of added 5% / K S O , 0.75 mL (if used) 2 2 8 V 2 2 4
W
V(NH OH = volume of added 10% / hydroxylamine sulfate, 1.0 mL 2 V
W
The amount of mercury in the HNO –H O solution blank is calculated in the same way. 3 2 2
15.3.2 *H SO –KMnO Solution (Impingers 5– 7)*— Calculate the concentration of mercury 2 4 4
in µg/L in the H SO –KMnO impinger solutions using Equation 13: 2 4 4
Mercury, µg/L = (IR)(DF) [Eq. 13]
where:
DF = dilution factor, V + **V(HNO)** + V(K S O) + **V(NH OH)** D 2 2 8 3 2
VD
IR = instrument reading, µg/L
V = total digested volume, 5 mL D
V(HNO) = volume of added concentrated HNO , 0.5 mL 3 3
V(K S O) = volume of added 5% / K S O , 0.75 mL 2 2 8 V 2 2 4
W
The concentration of mercury in the H SO –KMnO solution blank is calculated in the same way.
2 4 4
15.3.3 *Total Elemental Mercury (Hg)*— is defined by method as the mercury measured E
in the H SO –KMnO impingers plus the mercury in the HNO –H O impingers minus the solution
2 4 4 3 2 2
blanks as shown in Equation 14:
Hg , µg = (Hg)(V) – (Hg)(V) + (Hg)(V) – (H)(V) [Eq. 14] E H2O2 4 Eb1 4 KMnO4 5 Eb2 5
EPRI. "Evaluation of Flue Gas Mercury Speciation Methods," EPRI TR-108988, 9
Electric Power Research Institute, Palo Alto, CA, Dec. 1997.
where:
Hg = Mercury concentration measured in HNO –H O aliquot, µg/L H2O2 3 2 2
V = Total volume of aqueous HNO –H O from which sample aliquot was taken, L 4 3 2 2
Hg = Mercury concentration measured in HNO –H O solution blank aliquot, µg/L Eb1 3 2 2
Hg = Mercury concentration measured in H SO –KMnO aliquot, µg/L KMnO4 2 4 4

V = Total volume of aqueous H SO –KMnO from which sample aliquot was taken, L 5 2 4 4
Hg = Mercury concentration measured in H SO –KMnO solution blank aliquot, µg/L Eb2 2 4 4
The concentration of Hg (µg/dscm) in the gas stream is then determined using Equation 15: 2+
Hg , µg/dscm = Hg /V [Eq. 15] 0
E m(std)
where:
V is the total volume of dry gas sampled at standard conditions, dscm m(std)
15.4 *Total Mercury*— Is defined by the method as the sum of the particulate bound mercury, oxidized mercury, and elemental mercury as shown in Equation 16:
Hg(total), µg/dscm = Hg + Hg + Hg [Eq. 16] tp 2+ 0

16. Precision and Bias

16.1 *Precision*

16.1.1 Formal evaluation of the Ontario Hydro method was completed with dynamic spiking of Hg and HgCl into a flue gas stream. The results are shown in Table 1. The relative 0 9 2
standard deviation for gaseous elemental mercury and oxidized mercury was found to be less than 11% for mercury concentrations greater than 3 µg/Nm and less than 34% for mercury 3
concentrations less than 3 µg/Nm . In all cases, the laboratory bias for these tests based on a 3
calculated correction factor was not statistically significant. These values were within the acceptable range, based on the criteria established in EPA Method 301 (% RSD less than 50%).

16.1.2 The precision of particle-bound, oxidized, and elemental mercury sampling method data is influenced by many factors: flue gas concentration, source, procedural, and equipment variables. Strict adherence to the method is necessary to reduce the effect of these variables. Failure to assure a leak-free system, failure to accurately calibrate all indicated system components, failure to select a proper sampling location, failure to thoroughly clean all glassware,
and failure to follow prescribed sample recovery, preparation, and analysis procedures can seriously affect the precision of the results.

16.2 *Bias*

16.2.1 Gaseous mercury species in flue gases that are capable of interacting with fly ash particles collected in the front half of the sampling train can produce a positive particle-bound
mercury bias.

16.2.2 Particle-bound mercury existing in the flue gas may vaporize after collection in the front half of the sampling train because of continued exposure to the flue gas sample stream and reduced pressures during the sampling period. Such vaporization would result in a negative particle-bound mercury bias.

Table 1
Results from Formal EPA Method 301 Evaluation Tests for the Ontario Hydro Method*

Total Vapor-Phase Mercury	**Oxidized Mercury**		**Elemental Mercury**		**Ontario Hydro Method****	
Mean, µg/Nm	Std. Dev.	RSD, %	Mean, µg/Nm	Std. Dev.	RSD, %	
Baseline	23.35	2.05	8.79	21.24	2.13	10.02	2.11	0.65	30.69
Hg Spike (15.0 µg/Nm)	38.89	2.00	5.13	23.32	2.08	8.94	15.57	1.09	6.97
HgCl Spike (19.9 µg/Nm)	42.88	2.67	6.23	40.22	2.87	7.14	2.66	0.89	33.31

* For each mean result, there were 12 replicate samples (four quadtrains)
** The correction factor in all cases was not statically significant and is not shown.
17. Keywords— Air toxics, mercury, sampling, speciation

BIBLIOGRAPHY OF EPA METHODS REFERENCED

(1) Method 303F in *Standard Methods for the Examination of Water and Wastewater*, 15th Edition, 1980. Available from the American Public Health Association, 1015 18th Street N.W., Washington, D.C. 20036.
(2) EPA Methods 6010, 6020, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 7841, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. SW-846, Third Edition. September 1988. Office of Solid Waste and Emergency Response, U. S. Environmental Protection Agency, Washington, D.C. 20460.
(3) EPA Methods 1 through 5, *Code of Federal Regulations*, Title 40, Part 60, Appendix A, July 1, 1991.
(4) EPA Method 101A, *Code of Federal Regulations*, Title 40, Part 61, Appendix B, July 1, 1991.
(5) EPA Method 29, *Emission Measurement Technical Information Center*, EMTIC TM-029, April 25, 1996.
(6) U.S. Environmental Protection Agency "Method 301 þ Field Validation of Pollutant Measurement Method from Various Waste Media," In *Code of Federal Regulations*, Title 40, Parts 61 to 80. Washington, DC, USA, Office of the Federal Register, Part 63, Appendix A, pp 324þ331, July 1993.